



Avnet Programming Utility User Manual



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1.0 Introduction

This manual describes the installation, components (installed files) and operation of the Avnet Programming Utility (AvProg).

The Avnet Programming Utility allows an operator to connect a host computer to the:

1. Xilinx Spartan-3A Evaluation Board
2. Avnet Spartan-6 LX16 Evaluation Board

using a standard USB cable. Once the connection is made, the AvProg host interface (GUI) can be used to program the:

Spartan-3A
Xilinx FPGA
Spansion Serial Flash Memory
Spansion BPI Flash Memory

Spartan-6 LX16
Xilinx FPGA
Numonyx Serial Flash Memory¹

The utility communicates with the board via a USB cable, using a standard Windows USB2serial driver. The driver must be associated with the USB device (the board) whenever it is plugged in to a new USB port on the Windows host. This procedure is covered in the Installation section.

Following the installation section is a detailed description of all of the AvProg controls. You may want to read through this section to familiarize yourself with all the capabilities of the program, or you can simply refer to it later as needed. If you would like to get started quickly with your new board, refer to the Quick Start Guide in the Appendix. This section covers only the steps and controls needed to program the FPGA or flash memory.

For board specifications and documentation, as well as reference designs, please refer to the Avnet Design Resource Center at:

<http://em.avnet.com/drc>

¹ The LX16 can also accommodate a Spansion flash module.

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2.0 Installation

The software installation package for the Avnet Programming Utility is delivered as a single compressed file. Initial installation is a two step process, consisting of first running the self-extracting executable installer program, and then plugging the Spartan-3A Evaluation board into a host USB port to activate the Windows New Hardware Wizard to install the USB driver.

The installer package includes all of the required software components for the utility. The naming convention for this file is:

AvProg_vnnn_setup.zip

The “vnnn” sequence represents the version number of the installation package, and at the time of writing the current version is 400, corresponding to AvProg version 4.0.0. New releases of the software package will be posted to the Avnet Design Resource Center as they become available, so it is good practice to check the website periodically to ensure you are working with the latest software. The Avnet DRC can be accessed at:

<http://em.avnet.com/drc>

Installation of the software is supported on business versions of Windows XP, Windows Vista and Windows 7 Operating Systems.

2.1 Installing Host Software

1. Copy the compressed installation file to a folder on your Windows host.
2. Extract the installation files from the archive using the Windows built-in compress/uncompress utility, or a third-party package such as Winzip.
3. Double-click on the self-extracting executable (setup.exe) and follow the instructions in the Installshield wizard.
 - A. At the completion of the wizard, you will find the installed files located at:

C:\Program Files\Avnet\AvProg (Windows XP/Vista)
or
C:\Program Files(x86)\Avnet\AvProg (Windows 7)

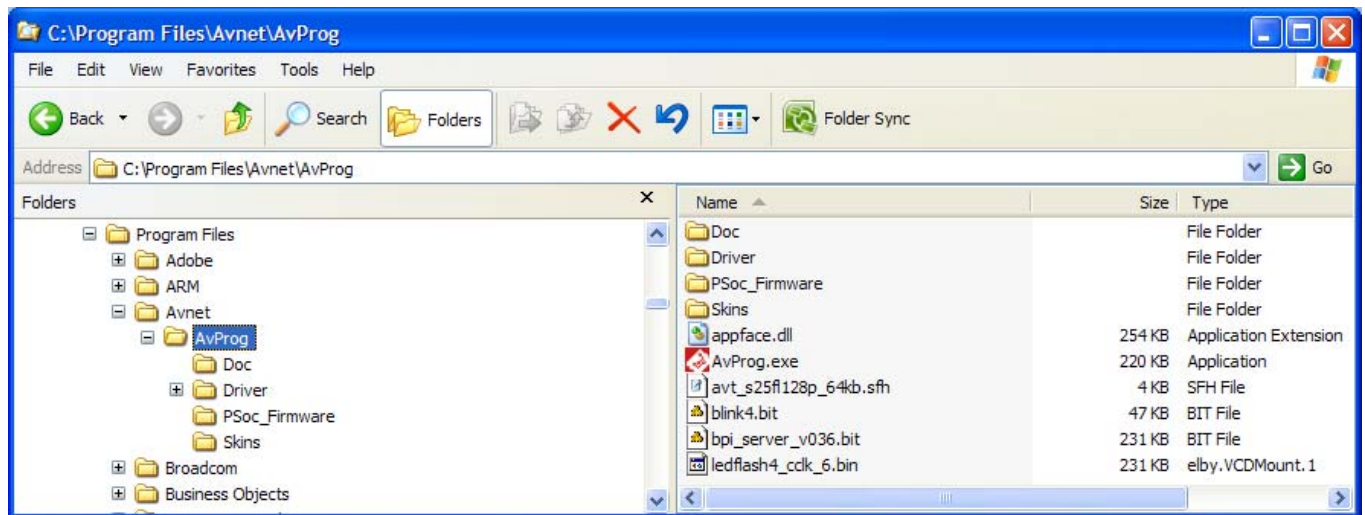


Figure 1 – AvProg Default Installation Folder (XP/Vista)

2.2 Installed Files

This section contains a description of the files and folders in the installation directory

Doc\Avnet_AvProg-UserGuide_vn_n_n.pdf

The current version of this document.

Driver\Windows\USBcdc_3AEval.inf

This is an installation file for the USB driver for the Spartan 3A Eval board on all supported Windows versions except for Windows XP SP3. You will point the Windows Hardware Wizard to this file during the driver installation, initiated the first time you plug the board into a new USB port on your Windows host.

Driver\Windows\USBcdc_LX16.inf

This is an installation file for the USB driver for the Spartan 6 LX16 board on all supported Windows versions except for Windows XP SP3. You will point the Windows Hardware Wizard to this file during the driver installation, initiated the first time you plug the board into a new USB port on your Windows host.

Driver\WindowsXP_SP3\USBcdc_XP_SP3_3AEval.inf

This is the driver installation file for Windows XP SP3 and the Spartan 3A Eval board. You will point the Windows Hardware Wizard to this file during the driver installation, initiated the first time you plug the board into a new USB port on your Windows XP SP3 host.

Driver\WindowsXP_SP3\USBcdc_XP_SP3_LX16.inf

This is the driver installation file for Windows XP SP3 and the Spartan 6 LX16 board. You will point the Windows Hardware Wizard to this file during the driver installation, initiated the first time you plug the board into a new USB port on your Windows XP SP3 host.

Driver\WindowsXP_SP3\usbser_AvProg.sys

This is a special driver file for Windows XP SP3. This file is referenced by the .inf file during the installation.

PSoc_Firmware\Spartan3AEval_PSoC_Revnnn_pd5sp45.hex

This is the software that runs on the Cypress PSoC 1 on the Spartan-3A board. It is pre-loaded to the device, so there should be no need to use this file. If at any time you change the firmware in the PSoC 1, you can use this file to restore the original factory settings, which are required to communicate with AvProg. The host program will verify that the correct version of the firmware is installed before any communication with the board can be initiated by the operator.

PSoc_Firmware\AvtLX16Eval_RevB_vn_n_n.hex

This is the software that runs on the Cypress PSoC 3 on the Spartan-6 LX16 board. It is pre-loaded to the device, so there should be no need to use this file. If at any time you change the firmware in the PSoC 3, you can use this file to restore the original factory settings, which are required to communicate with AvProg. The host program will verify that the correct version of the firmware is installed before any communication with the board can be initiated by the operator.

Skins*.urf

The Skins folder contains files used by the Appface.DLL library to customize the look of the AvProg interface. Do not change the location of this folder, and do not modify, rename or delete any of the files contained therein.

Appface.dll

A third-party library providing skinning services to the host interface. This library is bound to the host interface executable, and cannot be used with any other program. Skins allow a standard Windows application to be customized by applying non-standard colors and controls, such as gel-style buttons.

AvProg.exe

The Avnet Programming Utility executable file. The application can be launched by double-clicking the file in windows explorer, or by using the Windows Start menu to select:

(All) Programs | Avnet | AvProg

blink4_for_S3A.bit

A pre-built reference design for the Spartan-3A 400 FPGA. On download, this design simply blinks the 4 user LEDs on the Spartan-3A Evaluation board. Use AvProg to download this simple bitfile (hardware only, no processor) to test the USB connection between the host and the board.

blinky_for_AvtLX16.bit

A pre-built reference design for the Spartan-6 LX16 FPGA. On download, this design simply blinks the 4 user LEDs on the board. Use AvProg to download this simple bitfile (hardware only, no processor) to test the USB connection between the host and the board.

bpi_server_v037.bit

This is a MicroBlaze design that is loaded into the FPGA when AvProg is placed in the BPI Programming Mode. In this mode the host program acts as the client and communicates with the server to perform BPI operations such as ID check, Erase and Programming. AvProg will check the version of the server once it is running to ensure it is compatible with the version of the host software you are using.

ledflash4_cclk_6.bin

The Blink4.bit design, formatted for programming in the BPI flash.

spi_server_lx16_v002.bit

This is a MicroBlaze design that is loaded into the FPGA when AvProg is connected to the Spartan-6 LX16 Evaluation Board and placed in the SPI Programming Mode. In this mode the host program acts as the client and communicates with the server to perform SPI operations such as ID check, Erase and Programming. AvProg will check the version of the server once it is running to ensure it is compatible with the version of the host software you are using.

spi_server_v006.bit

This is a MicroBlaze design that is loaded into the FPGA when AvProg is connected to the Spartan-3A Evaluation Board and placed in the SPI Programming Mode. In this mode the host program acts as the client and communicates with the server to perform SPI operations such as ID check, Erase and Programming. AvProg will check the version of the server once it is running to ensure it is compatible with the version of the host software you are using.

2.3 Uninstalling the Avnet Programming Utility

To remove the Avnet Programming Utility from your host system, run the setup.exe file again and it will perform the uninstallation.

Alternately, you may activate the **Control Panel** from the Windows Start menu and use the standard Windows procedure corresponding to your operating system for removing programs.

2.4 Installing the USB Driver

The first time a supported board is plugged into a new USB port on a host system, the new hardware will be detected and the Windows New Hardware Wizard will activate. This device uses a standard USB driver that is already installed on the Windows host, but it must be associated with the device using an installation file. The installation file(s) are provided under the Drivers folder in the installation directory. Make sure you select the proper folder to match your system, depending on whether it is Windows XP SP3 or not.

Spartan Boards and Windows 7

If you have an older piece of hardware or a device that doesn't support Plug and Play, Windows 7 won't automatically recognize it when you connect the hardware or device to your computer. This may be the case for both the Spartan-3A and Spartan-6 LX16 Evaluation boards. However, you can manually add them to your computer using the Add Hardware Wizard.

Follow these steps:

- Click the Start button. In the search box, type run, and then, in the list of results, click Run.
- In the Run dialog box, type **hdwwiz**, and then click OK.
- Follow the instructions in the wizard, and then click Next.

Following the installation, you may receive error Code 10 indicating that the new driver could not start. In this case, unplug the USB connection to the board, and plug it back in. The board will be recognized and the driver will load and start correctly.

The next pages show the steps for activating the USB driver for the Spartan 3A Evaluation Board on a Windows XP SP3 system. For other supported hosts, the steps are not quite identical, but are similar enough that there should be few problems.

To associate the USB driver with the board, plug the small USB connector into the receptacle on the board, and the standard USB connector into any USB port on your host system. Follow the Wizard dialogs to associate the driver with the board:

1. New HW wizard activates. Select **No, not this time**. Click **Next**.



Figure 2 – Found New Hardware Wizard Dialog

2. Select **Install from a list or specific location**. Click **Next**. For the LX16, the device name is **S6LX16 Eval Board**.

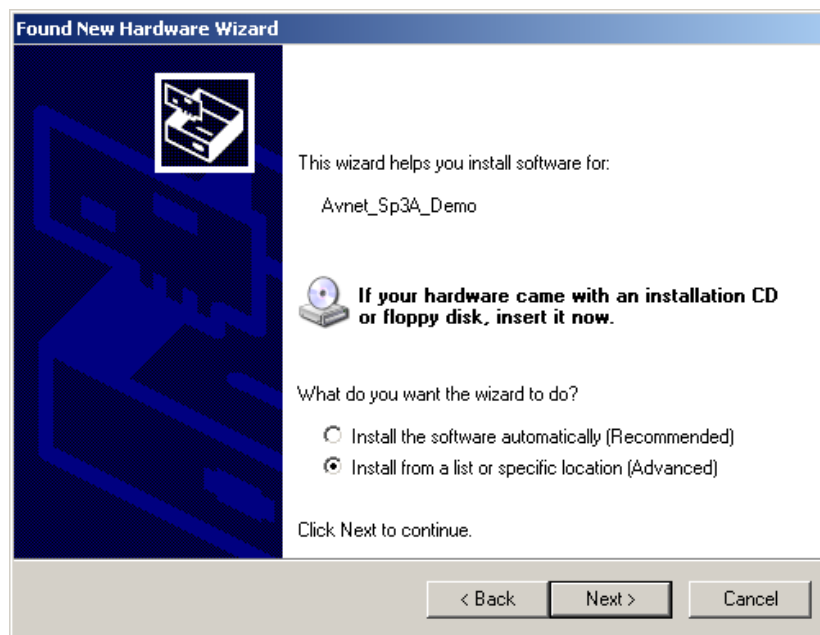


Figure 3 – Hardware Wizard for Avnet_Sp3A_Demo Dialog

3. Select **Don't search. I will choose the driver to install.** Click **Next**.

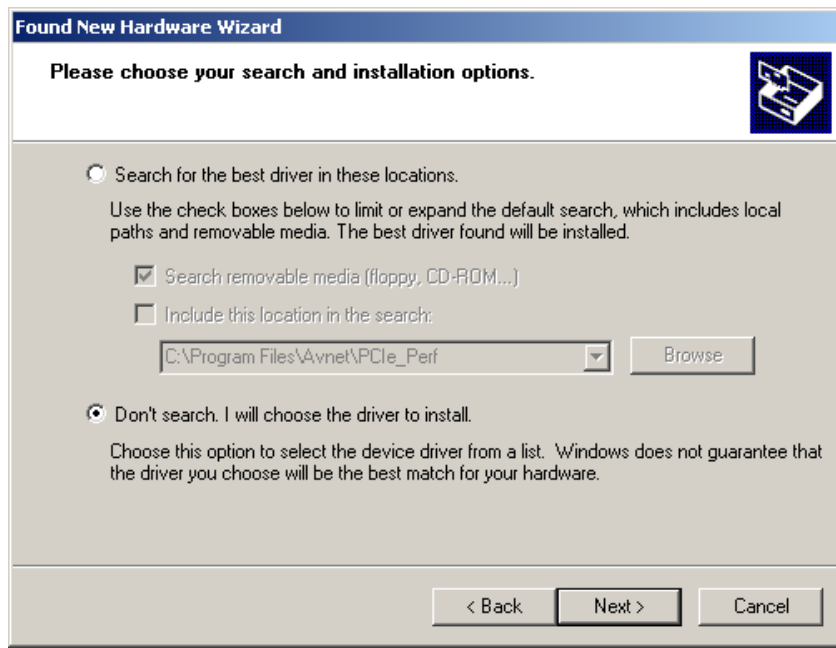


Figure 4 – Hardware Wizard Search and Installation Dialog

4. Click **Next**.

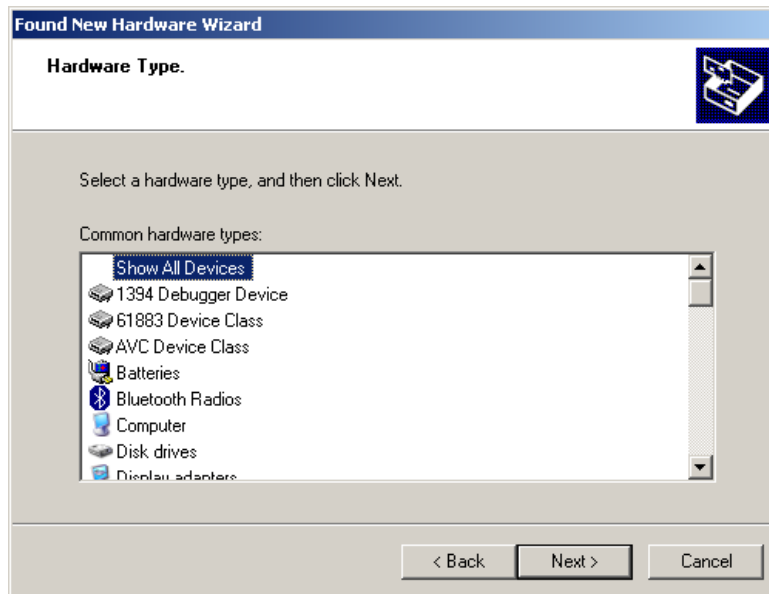


Figure 5 – Hardware Wizard Type Dialog

5. Click **Have Disk**.

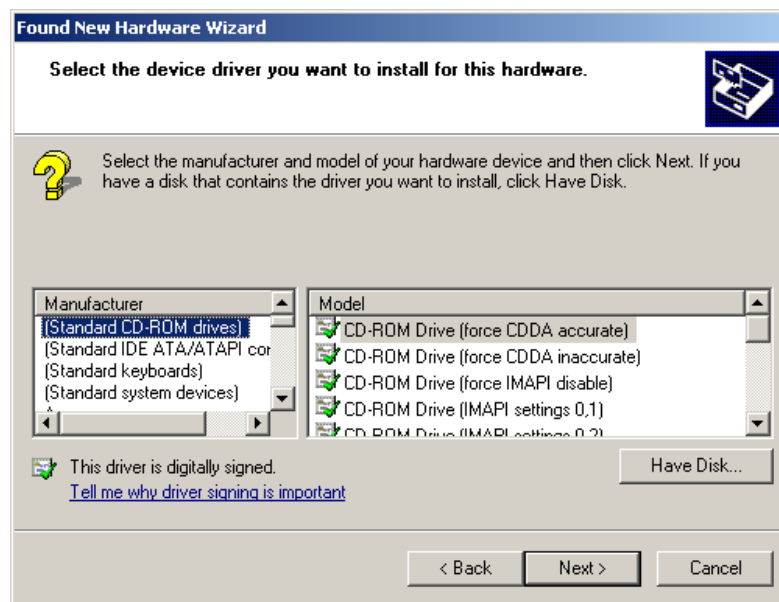


Figure 6 – Hardware Wizard Have Disk Dialog

6. Click **Browse**.

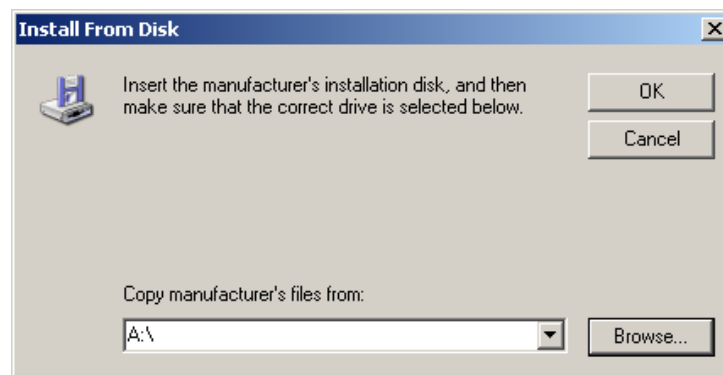


Figure 7 – Hardware Wizard Install From Disk Dialog

7. Browse to the **Driver** folder under the installation directory. For Windows XP SP3, select:

C:\Program Files\Avnet\AvProg\Driver\WindowsXP_SP3

For the Spartan 3A Eval, select **USBcdc_XP_SP3_3AEval.inf** and click **Open**. (shown)

For the Spartan LX16, select **USBcdc_XP_SP3_LX16.inf** and click **Open**.

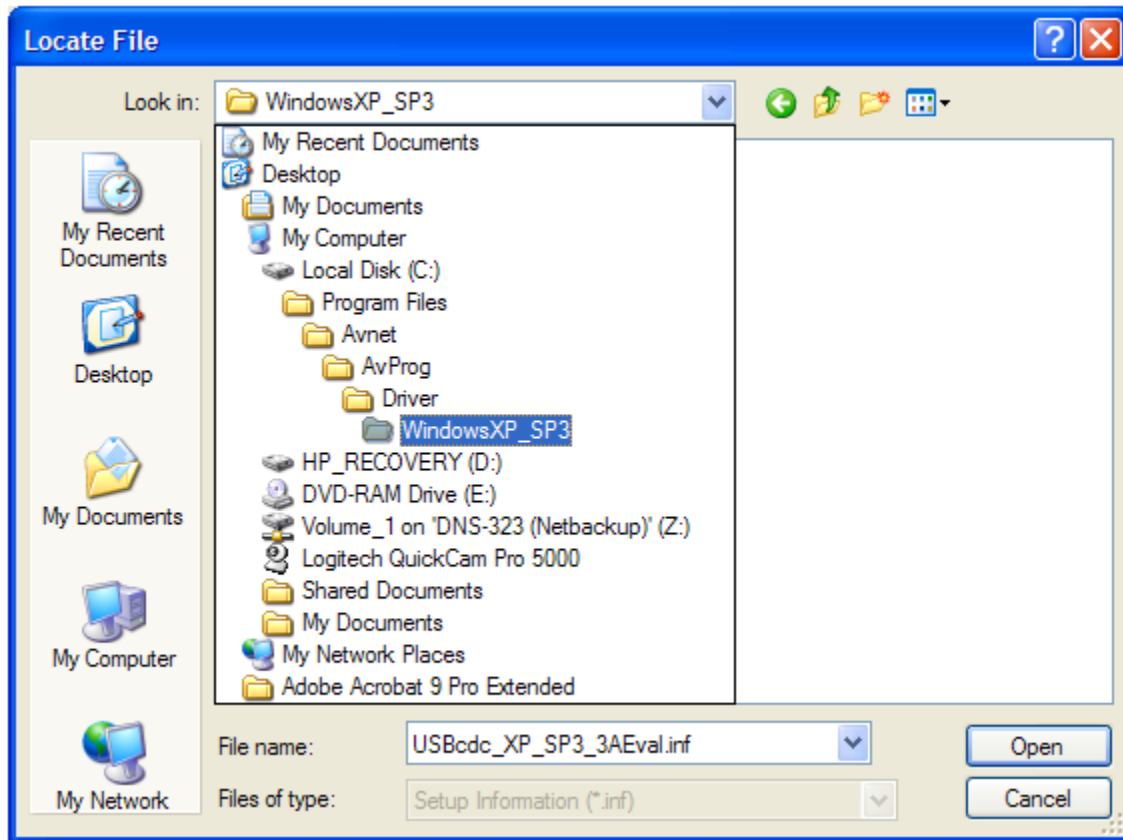


Figure 8 – Hardware Wizard Locate File Dialog

For all other supported Windows versions, browse to directory:

C:\Program Files\Avnet\AvProg\Driver\Windows

For the Spartan 3A Eval, select: **USBcdc_3AEval.inf**.

For the Spartan LX16, select: **USBcdc_LX16.inf**.

8. Click **OK**.

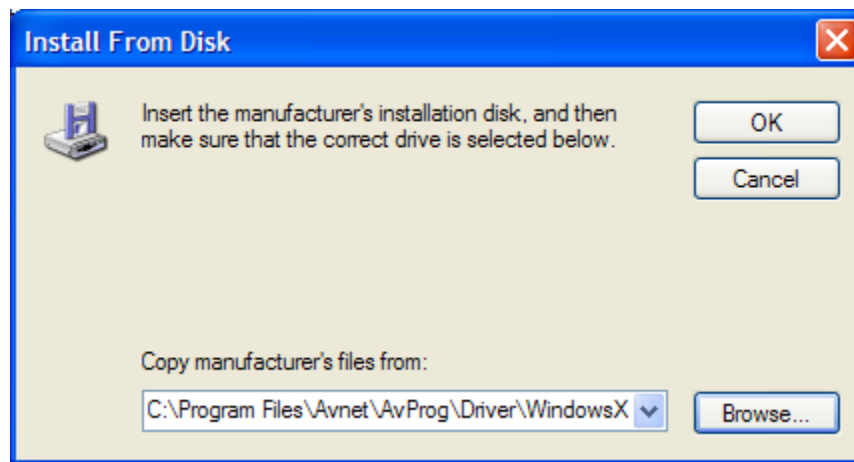


Figure 9 – Hardware Wizard Install From Disk Dialog

9. Click **Next**. For the LX16 the Model name will be S6LX16 Eval Board.

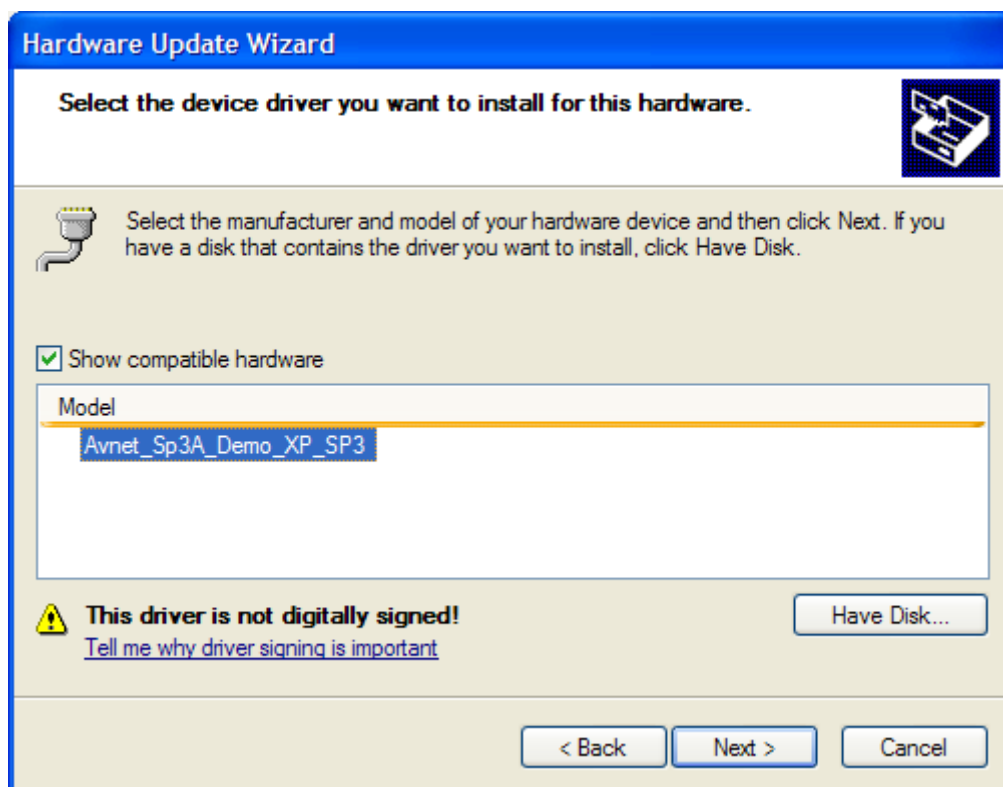


Figure 10 – Hardware Wizard Device Driver Select Dialog

10. If you get any warning screens, accept the "risks" and click through to the screen shown below. Click **Finish**. For the LX16, the device name will be S6LX16 Eval Board.

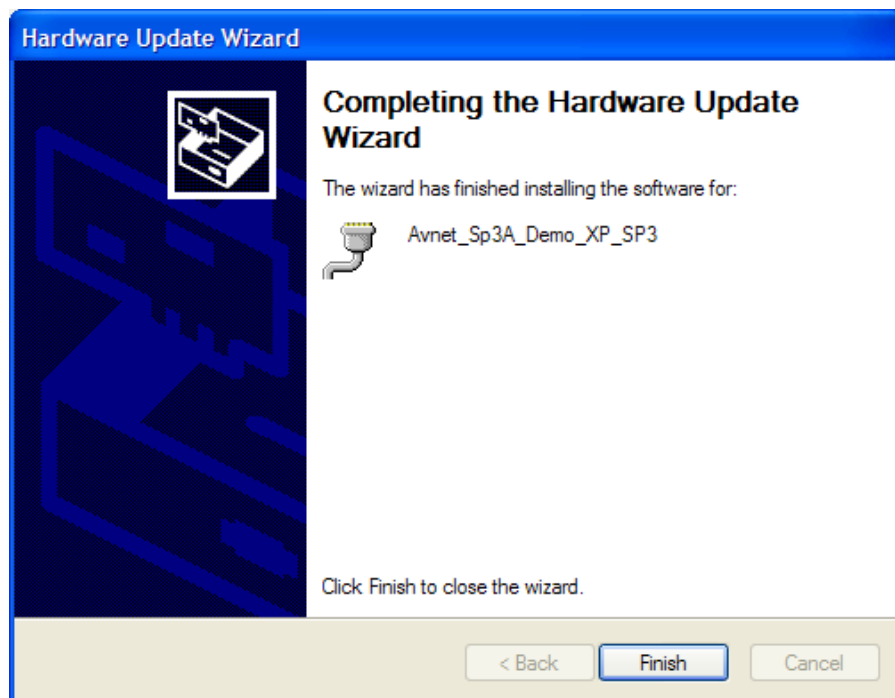


Figure 11 – Hardware Wizard Completion Dialog

Once installation is complete, you will see a new hardware message in the Windows taskbar.

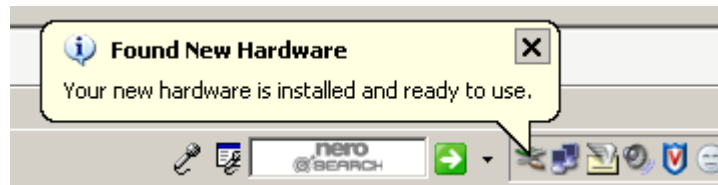


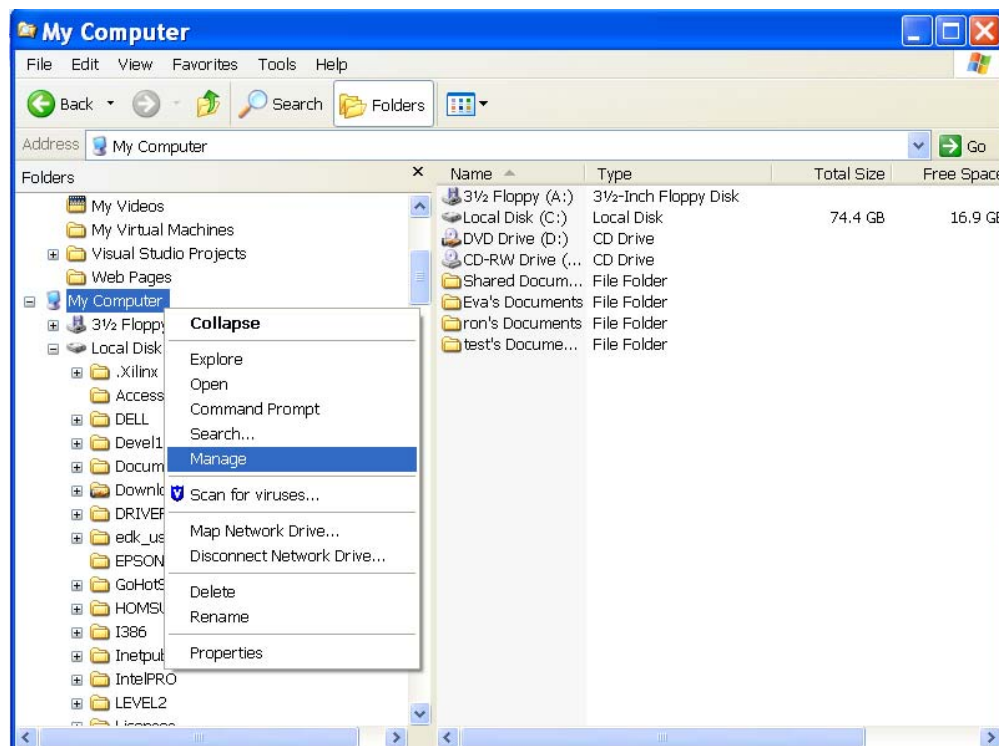
Figure 12 – Windows Found New Hardware Message

Your Avnet Programming Utility software is now fully installed and ready to use.

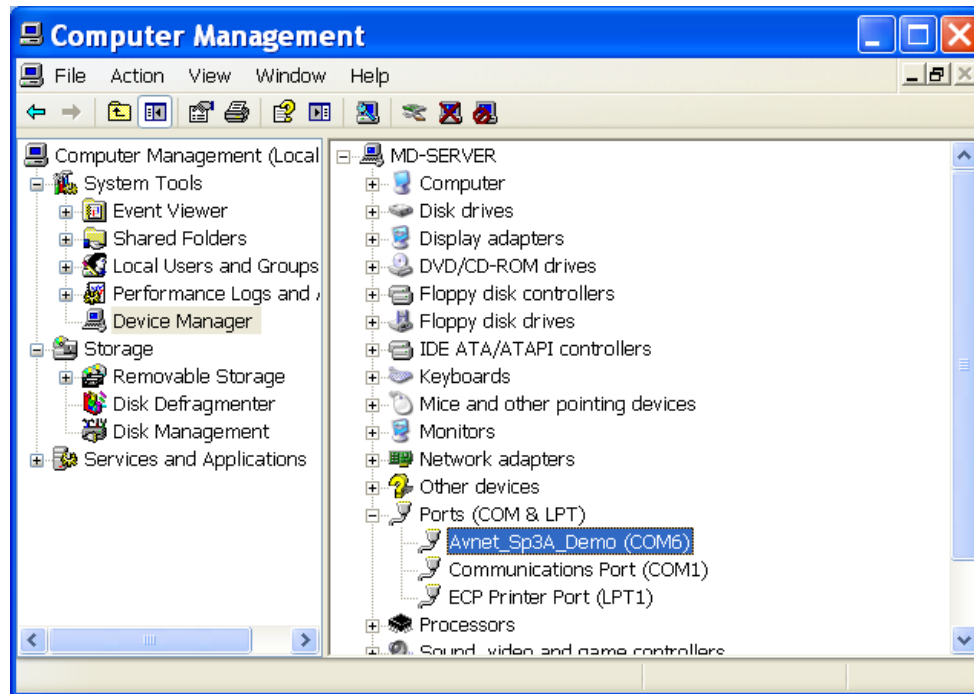
2.5 Updating an existing USB Driver

If it is necessary to update the USB driver in your system after you have installed AvProg, you can use the following steps. The screenshots are for the Spartan 3A Evaluation board, but the same procedure can be used for the Spartan-6 LX16 Evaluation board.

1. Plug the board into an available USB port on the host computer.
2. In Windows Explorer, right-click on **My Computer** and click **Manage** in the drop-down menu.



- Click **Device Manager** and expand the **Ports** entry to show the current driver installation (S3A Eval entry is highlighted). For the LX16 board, the entry will be named **S6LX16 Eval Board**.

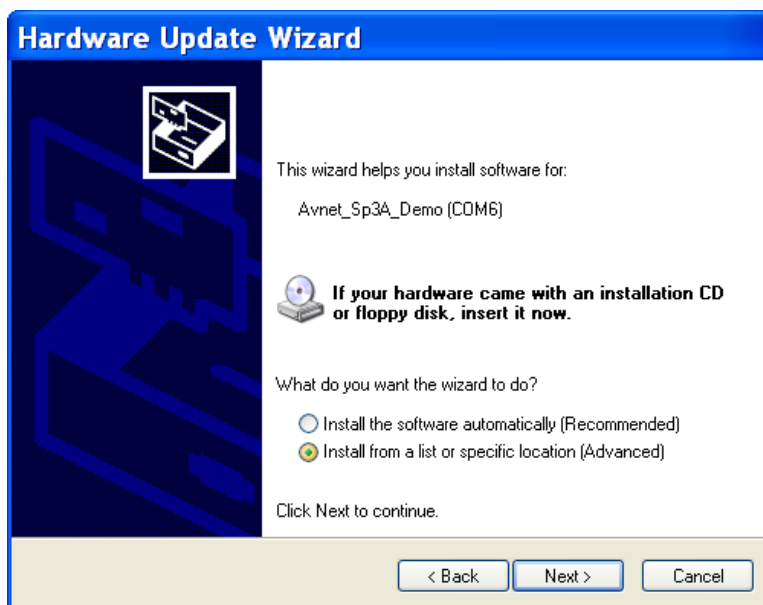


- Right-click on the current entry for the Avnet Spartan 3A Evaluation board and select **Update Driver**.

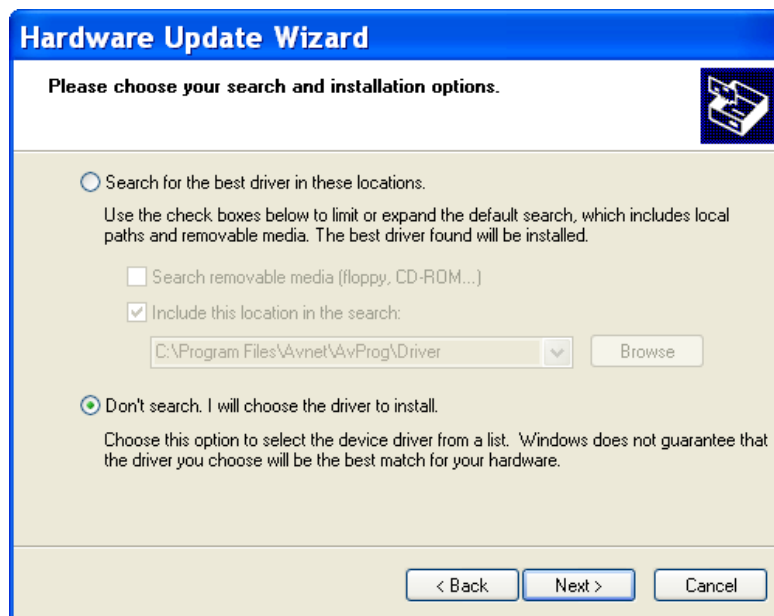
5. Select **"No, not this time"** and click **Next**.



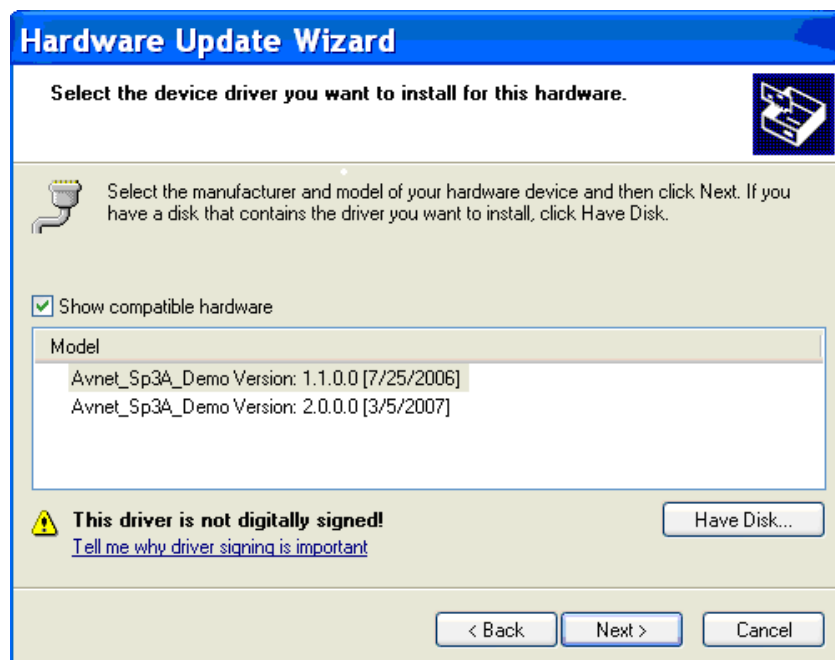
6. Select **"Install from a list or specified location"** and click **Next**.



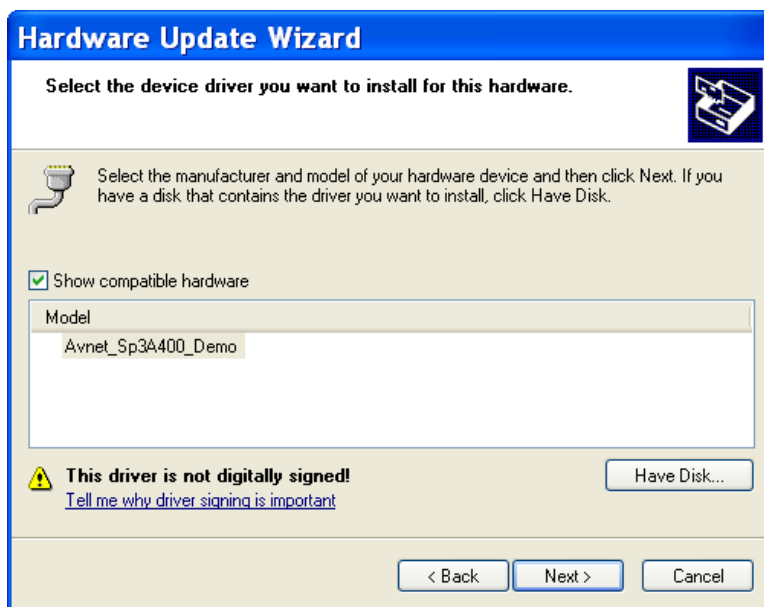
7. Select “Don’t search, I will choose the driver to install” and click **Next**.



8. Click the “**Have Disk**” button.



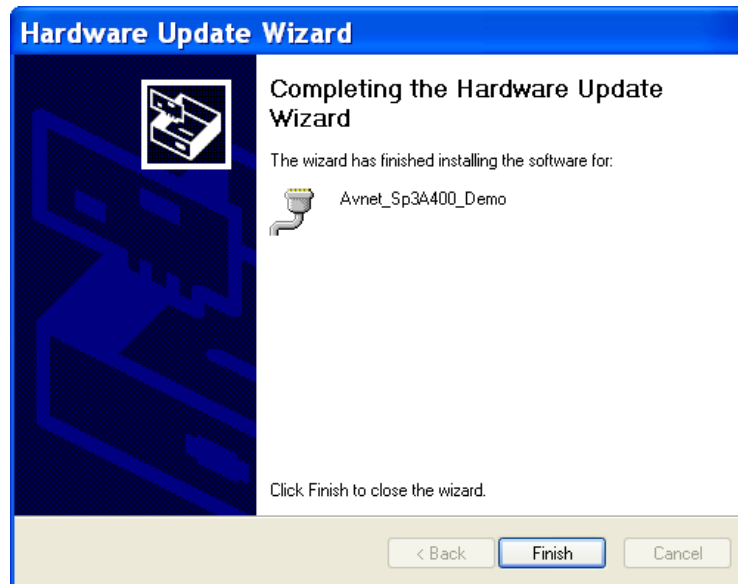
9. Browse to the location of the new device installation file (.inf) and select it. The file must be located in the same folder as the new driver you wish to install. Click the **Open** and **OK** buttons until you return to the Have Disk dialog. This dialog will now show the name of the new device you are installing. Click the Next button. The screen shot below shows the Spartan 3A driver, but for the LX16 board you will see **S6LX16 Eval Board**.



10. Click through any warning dialogs that may appear, such as the one shown below.

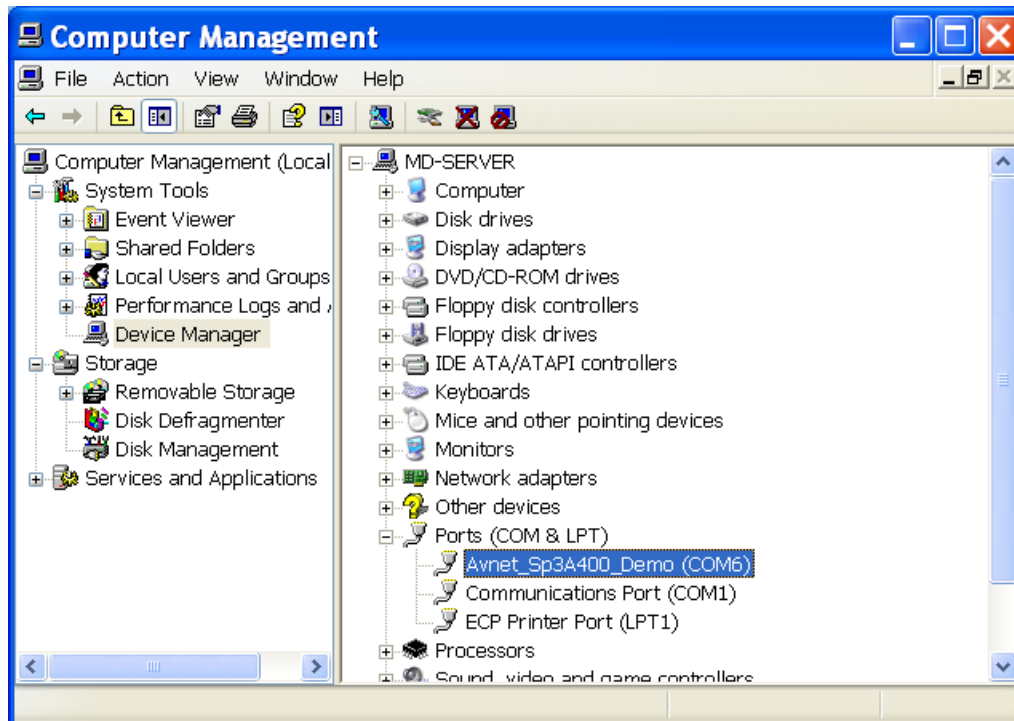


11. Once the new driver has been installed, a screen similar to the one below will appear with the name of your new device. Click **Finish**. For the LX16 board, the device name is **S6LX16 Eval Board**.

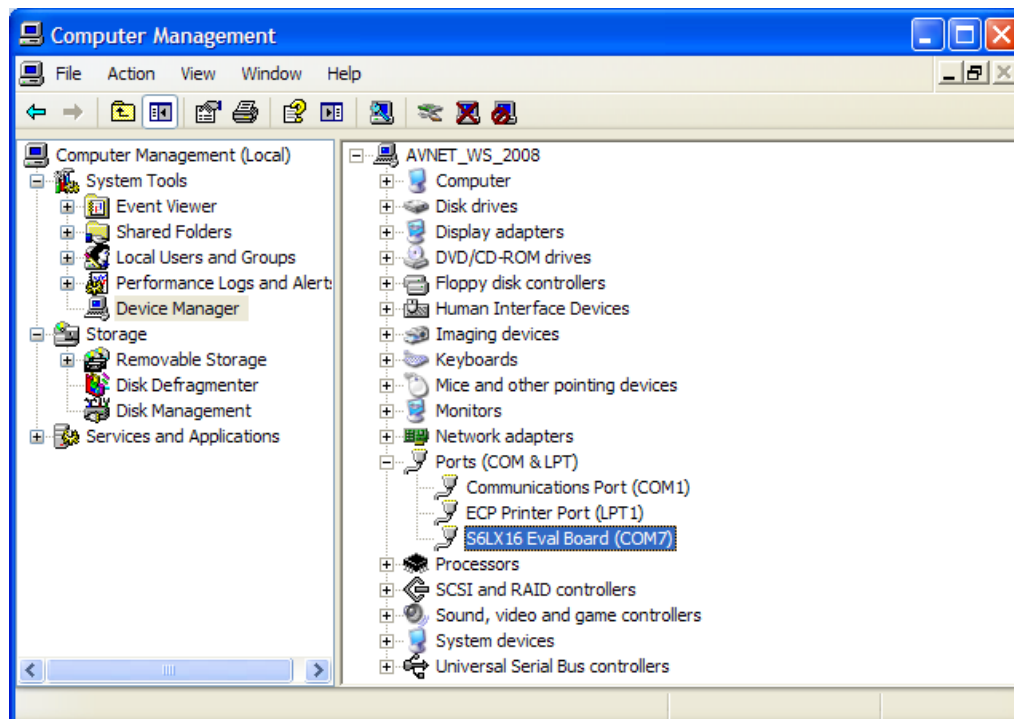


12. Your new device will now be listed in the Device Manager. Close the Device Manager.

Spartan 3A Eval:



Spartan LX16 Eval:



13. The last step is to unplug the Spartan-3A Evaluation Board from the USB port, and then plug it back in. This will allow Windows to associate the new driver with your hardware.

3.0 AvProg Host Interface

The Avnet Programming Utility package includes a Windows GUI to allow programming of the FPGA, SPI and BPI flash on a USB-connected board. The interface can also send and receive serial data over the USB connection, so that once an application starts running on the MicroBlaze processor, the output can be immediately viewed on the Receive console.

The GUI operates in one of three modes, depending on whether you are working with the FPGA, the SPI flash or the BPI flash. The USB connection looks to the user interface like a standard Windows Comm port.

3.1 Default Interface and Common Controls

The start-up mode for AvProg is **Configure FPGA**, but there are a number of controls that are common to all modes. The standard interface as it is seen at launch time is shown below, with the major control areas indicated with labels.

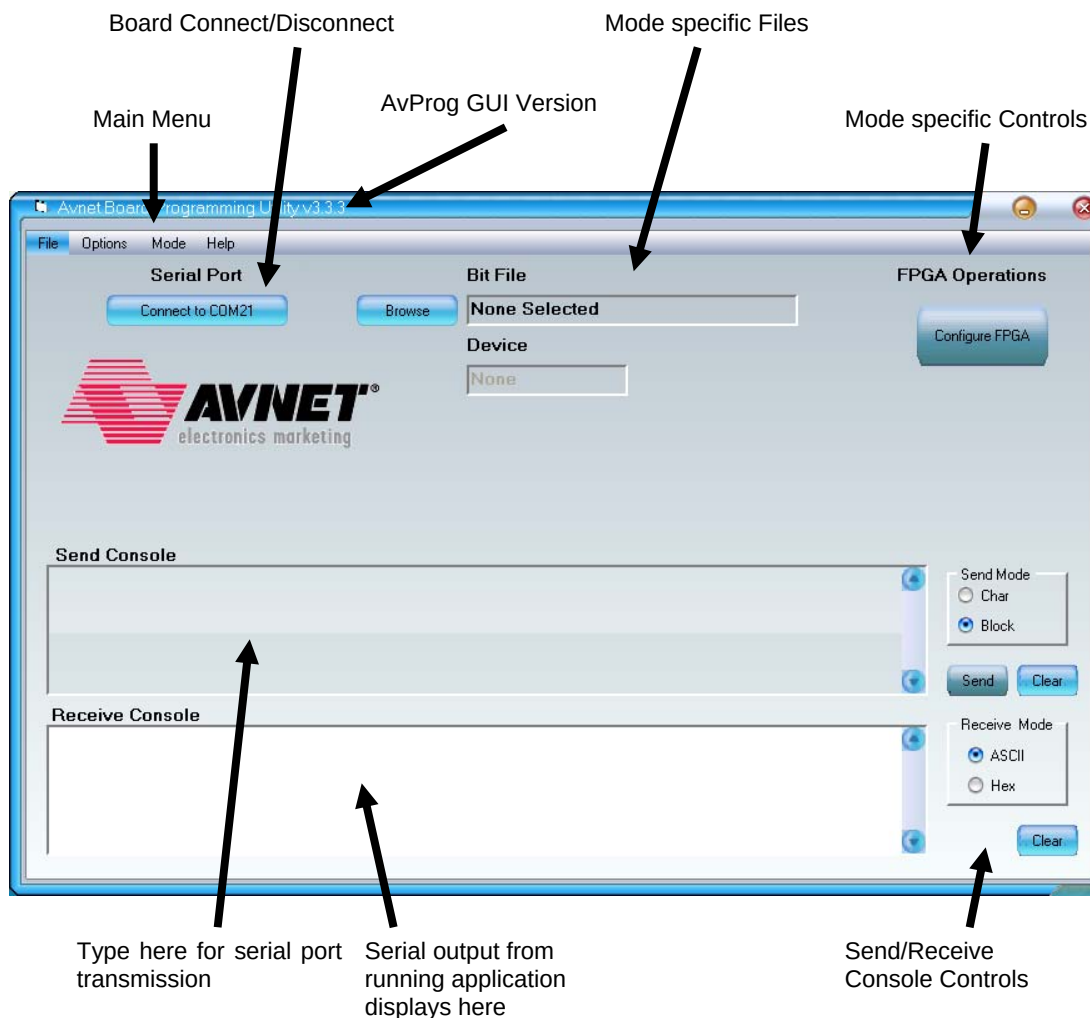


Figure 13 – AvProg Initial Interface

3.1.1 Main Menu – File

Select File – When programming the FPGA, SPI or BPI, a host file containing the source data is required. This item can be used to open a mode-sensitive file selection dialog. In normal operation, however, it is expected that most operators will use the Mode-specific file controls.

Exit – Terminate AvProg from this menu item, or click on the Windows close control on the far right side of the title bar.

3.1.2 Main Menu – Options

Comm – Activate the Comm Properties dialog to change the serial communication parameters between the host and the board. These parameters are used only for serial communication with a running FPGA application. For programming the FPGA, a low level driver is used to communicate with the PSoC, independent of the serial values set. For indirect programming of the BPI and SPI, AvProg automatically downloads a special server platform to the FPGA, which communicates at 115200, again independent of the values set in the Comm Properties dialog.

The Comm Properties dialog and its control functions are shown below.

Select a Comm Port from the dropdown list. If the board is plugged in, the first port shown will be the one connected to the board. Only ports registered on the host will be shown in the dropdown list.

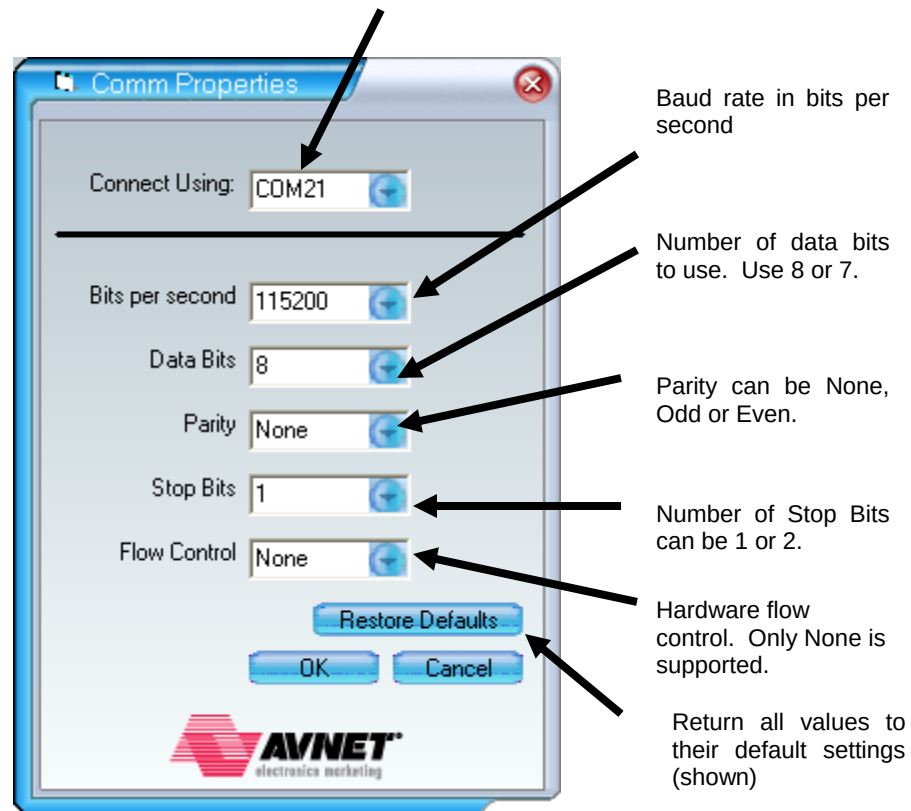


Figure 14 - Communication Properties Dialog

Disable Board Check / Enable Board Check - When the Board Connect button is pressed on the initial interface, AvProg will attempt to communicate with the PSoC on the board, as AvProg must be in communication with the PSoC to perform programming functions. If the PSoC does not respond, a warning is issued to the operator indicating that the board was not plugged into the indicated Comm port.

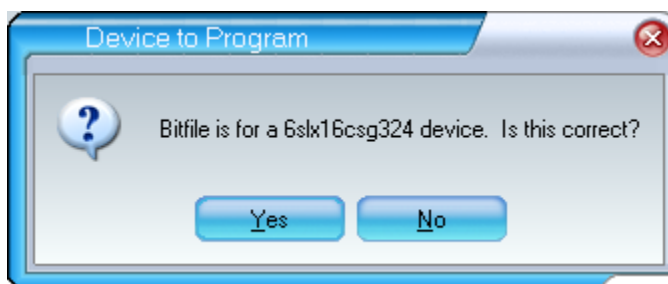


Figure 15 – Board not connected Warning Dialog

In some cases, however, it is desirable to use AvProg strictly as a serial communications device, so you may use this menu selection to disable the check for a connected board. Once the board check is disabled, the menu item changes to **Enable Board Check**.

Advanced – On some computer systems the default PSoC communications parameter settings do not allow a reliable channel to be established with the board over the USB link. In this case, the Advanced menu exposes the communications parameters so they can be changed. The menu item will be checked when the advanced interface is present. Selecting the checked menu will close the Advanced interface. If you change the default value in the controls, the values will be retained when AvProg closes in a file called AvProg.ini in the same folder as the executable. You can restore all the defaults by simply deleting the AvProg.ini file between AvProg executions. For information on how to change the PSoC communication parameters, please see the section entitled “Advanced Panel Controls”.

Quiet – In the default operating mode, certain standard operations such as FPGA configuration and SPI programming will issue a prompt to the operator to warn against mistakes that may be of concern to novice users. For example, in FPGA configuration, the operator is prompted to verify that the bitstream is for the correct device, as shown below.



If you select Quiet mode, indicated when a checkmark appears in front of the menu item, then these prompts are suppressed. This state will be retained across invocations of AvProg, so once you are familiar with the prompts you can switch them off permanently if you so desire. You can also turn Quiet mode off by selecting the checked menu item

3.1.3 Main Menu – Mode

There are four possible operational modes for AvProg. The active mode will have a checkmark to the left of the menu item. Changing the mode will also update the Mode-specific File and Mode-specific Control areas on the interface.

Configure FPGA – The startup mode for AvProg, used to download a bitstream to the FPGA on the board.

Program SPI Flash – Use this mode to program the onboard serial flash.

Program Parallel Flash – Use this mode to program the onboard BPI flash.

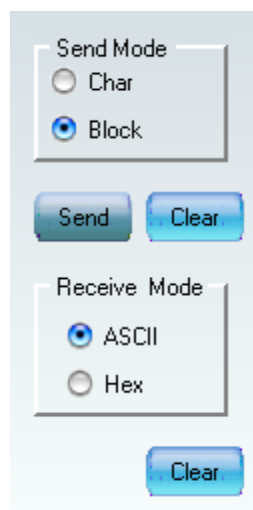
Measure LX16 Power – Use this mode to monitor System power and battery condition. This is available for the Spartan-6 LX16 board only..

3.1.4 Main Menu – Help

About – Displays a dialog box with the current version of the AvProg GUI, plus the versions of the PSoC firmware and BPI server which are designed to work with the particular GUI version. From time to time software updates are created, and it may be necessary to update one or more components of the installed package. In this event, software will be available for download on the Avnet Design Resource Center.

<http://em.avnet.com/drc>

3.1.5 Serial Console Controls



The serial controls are located at the bottom right of the GUI. The Send Mode block affects communication in the Send Console, while the Receive Mode block affects the Receive Console display.

Send Mode Block – the PSoC firmware can respond to textual commands, but they must be transmitted as a block of text followed by a null character. In this mode you may type a command, and then press the Send button to transmit it to the PSoC.

Send Char Mode – each character is transmitted over the USB serial link as it is typed. This is the normal mode for communication with an interactive application running on the FPGA

Receive Mode ASCII – incoming characters on the serial interface are displayed in the ASCII character set.

Receive Mode Hex – incoming characters on the serial interface are displayed in hexadecimal format.

The **Clear** buttons can be used at any time to erase the entire contents of their respective consoles.

3.2 Configure FPGA Mode Controls

To program the FPGA, you must:

1. Connect to the PSoC on the board (Click the **Connect** button).
2. Specify a bitstream file to download.
3. Press the Configure FPGA button.

3.2.1 Bit File Controls

To specify a bit file you must activate the **Select Bitfile** dialog. This can be done from the **File** menu, by clicking on the **Browse** button, or by double-clicking in the **Bit File** text box.

To display the Select Bitfile dialog, click the **Browse** button, or

Double-click in the text box. Alternately, you can use **File | Select File** in the main menu.

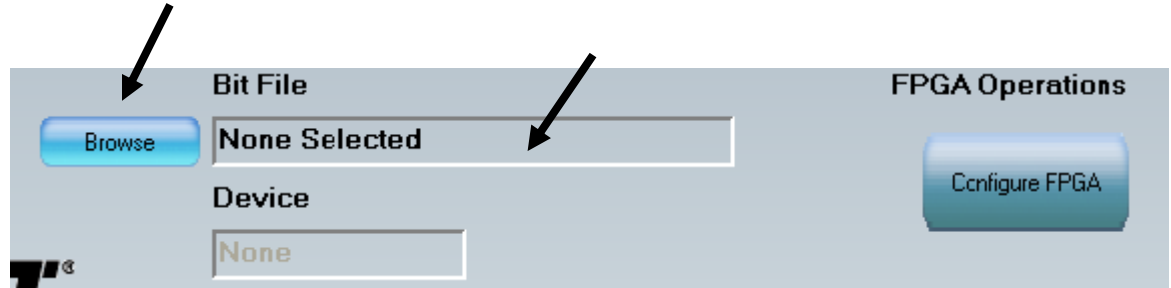
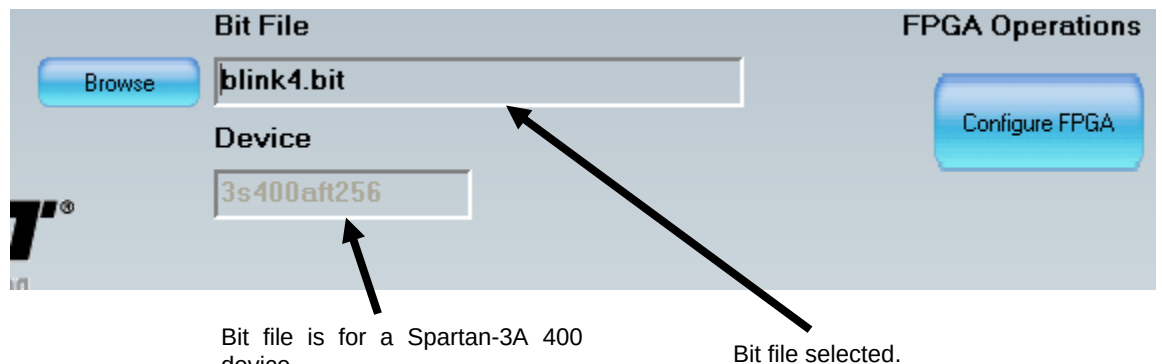


Figure 16 – Bit File Controls

When the Select Bit file dialog displays, navigate to the desired file, select it in the window and click the **Open** button. If the file is a valid bit file, the FPGA Device will automatically be filled in, as shown below.



Bit file is for a Spartan-3A 400 device.

Bit file selected.

Figure 17 – Bit File ready to Configure

3.2.2 Configure FPGA

The **Configure FPGA** button will not activate until a bit file has been selected, and the connection between AvProg and the board has been activated via the **Connect** button. However, once the button is active, simply click it to initiate the programming sequence.

The following dialog will appear to allow you to confirm that the bit file was created for the device on your connected board. If this is not the case, click **No** to abort the programming sequence. Click **Yes** to program the FPGA. It is entirely up to the operator to verify that the bit file is correct for the device on the connected board.



Figure 18 – FPGA Device Warning Dialog

In most cases, the FPGA will program and start running immediately. AvProg writes a success message in the Receive Console and automatically switches from its default USB connection mode to a standard USB-serial driver, using the communications parameters in the Comm panel. All output from the application will appear in the Receive Console.

If there is a failure during the programming sequence, it is probably due to one of the following conditions:

1. **Programming succeeded, but Done did not go high.** This is generally an indication that the wrong clock was used to generate the bitstream. Please ensure that CCLK, and not JTAG clock, has been used.
2. **FPGA programming failed!** This is typically an indication that there is a problem with the design. It could be a bit file created for another device, or it could have marginal timing that causes it to fail on download. If you cannot determine the problem, contact your local FAE for assistance.
3. **No value for Done pin.** In this case, contact with the board may have been lost immediately after programming. The FPGA may actually have programmed correctly in this case. This is very unusual, and is likely caused by a faulty USB cable, or a reconfiguration of the host Comm ports during the programming sequence.
4. **Init value is not high.** This is a warning message that indicates that AvProg expected a status value from the PSoC, and it did not arrive in the specified time. In most cases this will not affect the programming of the FPGA. If you see this message repeatedly, and the FPGA does not program, contact your FAE for assistance.

3.3 Program SPI Flash Controls

To program the SPI Flash, you must:

1. Connect to the PSoC on the board (Click the **Connect** button).
2. Select the board type. For the S3A or S6 LX16 Evaluation boards, the selection is made automatically when the Connect button is pressed.
3. Specify a SPI server. For the S3A or S6 LX16 Evaluation boards, the selection is made automatically when the Connect button is pressed.
4. Specify a file to program.
5. Optionally, you may specify a hexadecimal offset from the start address to begin programming.
6. Optionally, select a byte count less than the total number of bytes in the file.
7. Load the SPI server.

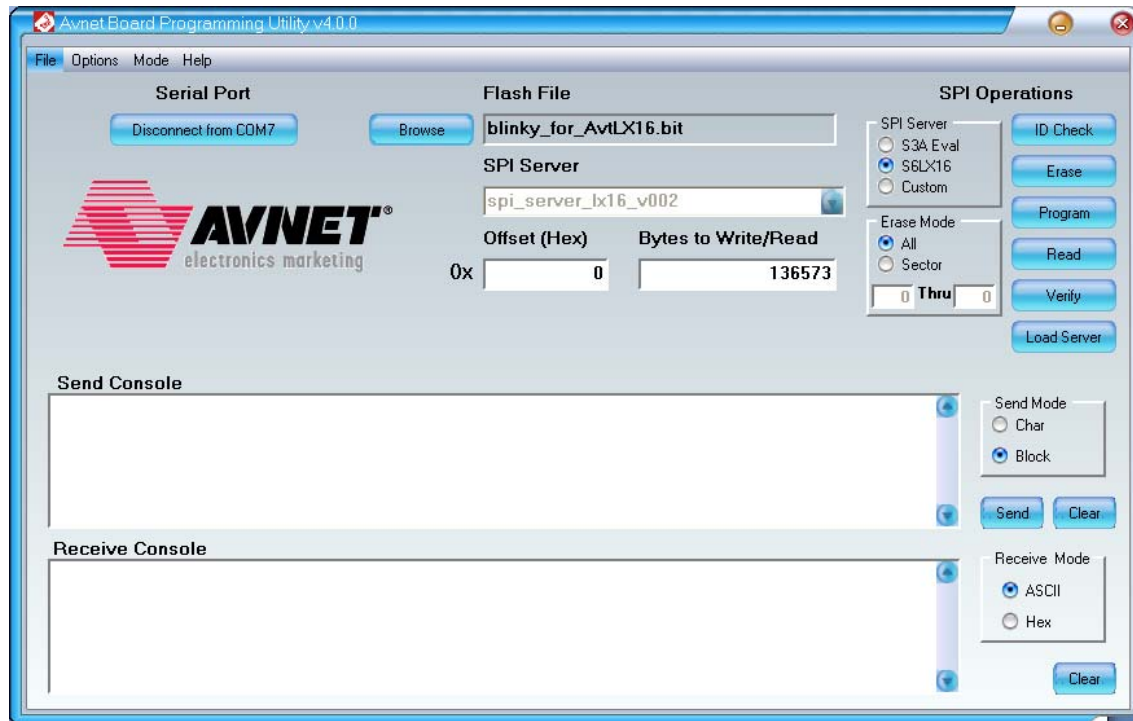


Figure 19 – AvProg SPI Mode

3.3.1 SPI File Controls

To specify a file you must activate the **Select SPI File** dialog. This can be done from the **File** menu, by clicking on the **Browse** button, or by double-clicking in the **Flash File** text box.

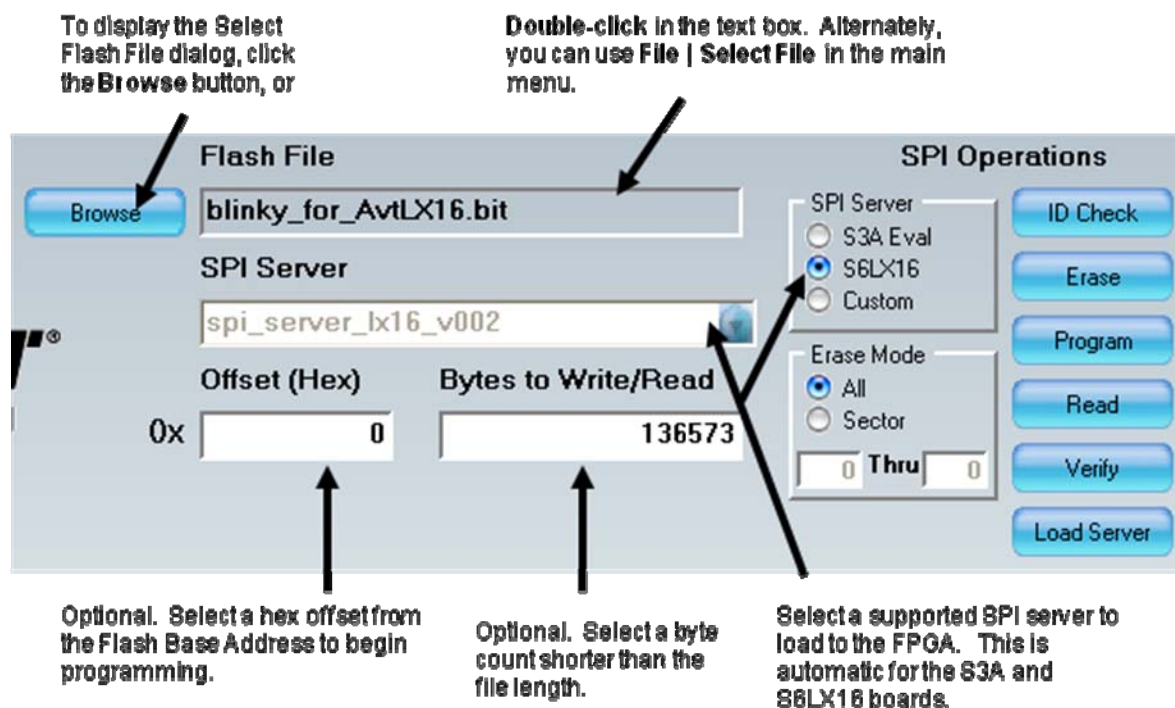


Figure 20 – SPI File Controls

When the Select Flash file dialog displays, navigate to the desired file, select it in the window and click the **Open** button.

The offset value must begin on a SPI sector boundary. It is the responsibility of the operator to be aware of the sector sizes and addresses in the device.

The byte count is automatically set to the size of the selected file, but this value can be changed to program only part of the file if desired.

3.3.2 Load Server

The SPI flash is programmed indirectly from the AvProg GUI, by directing a MicroBlaze program (the SPI Server) running in the FPGA. The SPI Server receives instructions and data from AvProg, but it is the server that performs the actual programming. You **MUST** load the server before you will be able to access the rest of the SPI program function buttons.

The servers included with the package are for the Spartan-3A and the Spartan-6 LX16 Evaluation boards. You can write your own SPI server for a custom board, and it will appear in the SPI Server dropdown list if:

1. you place the bit file in the AvProg installation folder, and
2. name the file in the same format as shown above, with a different version number.
(spi_server_vNNN.bit)

To change the SPI server used, you must first click on **Custom** radio button to the left of the SPI Server dropdown list.

When using the supplied servers, the version of the server software has been matched with the AvProg GUI. If the versions are incompatible an error message will be issued when you try to load the server. In this case you will need to update the software from the Avnet DRC.

3.3.3 ID Check

The **ID Check** button will not activate until communication between AvProg and the board has been established via the **Connect** button, and the SPI server has been loaded. Each flash family has a unique ID, so it is always good practice to click the **ID Check** button once to verify that there is a good communication path between AvProg and the SPI device, and that the expected device is present.

If the operation is successful, the flash ID will print in the receive console. If a failure occurs, a message dialog will display to indicate the reason.

1. **ID code does not match expected value** – The flash device specified does not match the hardware on the board. Either you have connected the wrong board, or you have selected the wrong device from the dropdown list..
2. **Connection with PSoC lost** – This is most likely caused by a faulty USB cable, or a loss of power to the board if you are not using USB power. In rare cases it is possible that the USB driver has locked up. To correct this condition, follow this sequence:
 - a. Disconnect the USB cable from the host computer.
 - b. Click the **Disconnect** button on the AvProg interface
 - c. Reconnect the USB cable to the host. You may want to try a different USB port.
 - d. Click the **Connect** button on the AvProg interface.

3.3.4 Erase

The **Erase** button will not activate until communication between AvProg and the board has been established via the **Connect** button, and the SPI server has been loaded.

To erase the entire flash, select the **All** button in the Erase Mode panel and click the **Erase** button. AvProg sends an appropriate command sequence to the PSoC, which initiates the device erase. Depending on the device size, a full erase can take several minutes. AvProg will issue a message for the supported boards indicating an approximate wait time.



To erase specific sectors, click the Sector button in the Erase Mode panel, and pick a range of sectors to clear. Click the Erase button to execute the operation. As each sector is cleared, the sector number will appear in the receive console..

3.3.5 Program

The **Program** button will not activate until communication between AvProg and the board has been established via the **Connect** button, the SPI server has been loaded, and a Flash file has been specified.

Once the **Program** button is activated, simply click to begin writing the file at the specified offset.

Valid programming can only occur when the sectors to be written have been previously erased. It is entirely the responsibility of the operator to ensure this condition exists prior to programming.

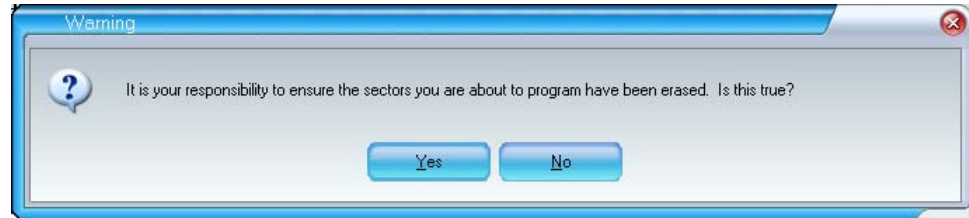


Figure 22 – SPI Program Erase Warning Dialog

If the sectors have been erased, click **Yes**. To abort the programming operation, click **No**.

If programming proceeds, AvProg transfers the data file to the BPI server running on the board, and it performs the programming operation at the specified location.

3.3.6 Read

The **Read** button will not activate until communication between AvProg and the board has been established via the **Connect** button, the SPI server has been loaded, and a Flash file has been specified.

This command reads the contents of the SPI memory for bytecount bytes from the specified offset and copies the data into your file. A warning message will post each time this command is activated to alert the operator that the specified file is about to be overwritten.

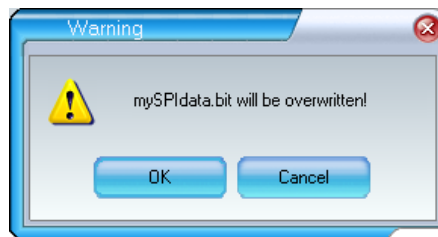


Figure 23 – SPI Read Overwrite Warning Dialog

Click **OK** to continue, and **Cancel** to abort the operation.

If you fail to specify the number of bytes to read, you will receive the following message.

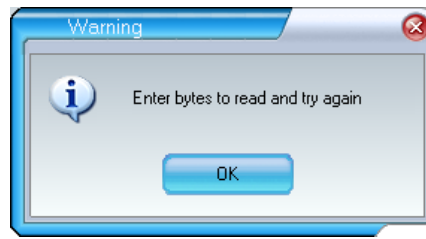


Figure 24 – SPI Read Byte Count Warning Dialog

Enter a byte count in the **Bytes to Read/Write** field and try the operation again.

3.3.7 Verify

The **Verify** button will not activate until communication between AvProg and the board has been established via the **Connect** button, the SPI server is loaded, and a Flash file has been specified.

This command reads the contents of the SPI memory for bytecount bytes from the specified offset and compares the data read with your file. No data is overwritten in this operation, but you must specify a byte count or you will receive the same warning message as seen above in the **Read** command.

Verify will report success if the data compares identically, or will report the first byte at which the comparison failed.

3.4 Program Parallel (BPI) Flash Controls

To program the BPI Flash, you must:

1. Connect to the PSOC on the board (Click the **Connect** button).
2. Load the MicroBlaze BPI server to the FPGA (Click the **Load Server** button).
3. Specify a file to program.
4. Optionally, you may specify a hexadecimal offset from the start address to begin programming.
5. Optionally, select a byte count less than the total number of bytes in the file.

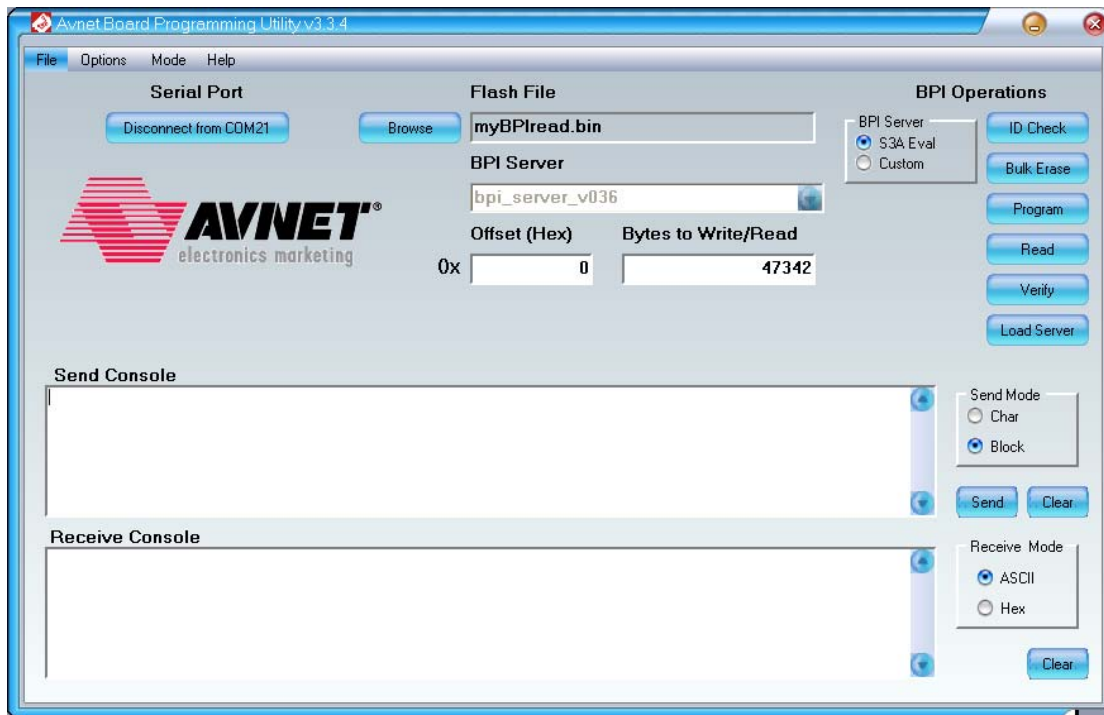


Figure 25 – AvProg BPI Mode

The BPI server is actually an interactive program originally designed for command line input. The output, including interactive prompts, are displayed in the Receive Console of AvProg. However, rather than typing commands into the AvProg send console, all interaction can be made using the BPI Operation buttons on the AvProg console. This eliminates entry errors, and provides more reliable operation.

3.4.1 BPI File Controls

To specify a file you must activate the **Select BPI File** dialog. This can be done from the **File** menu, by clicking on the **Browse** button, or by double-clicking in the **Flash File** text box.

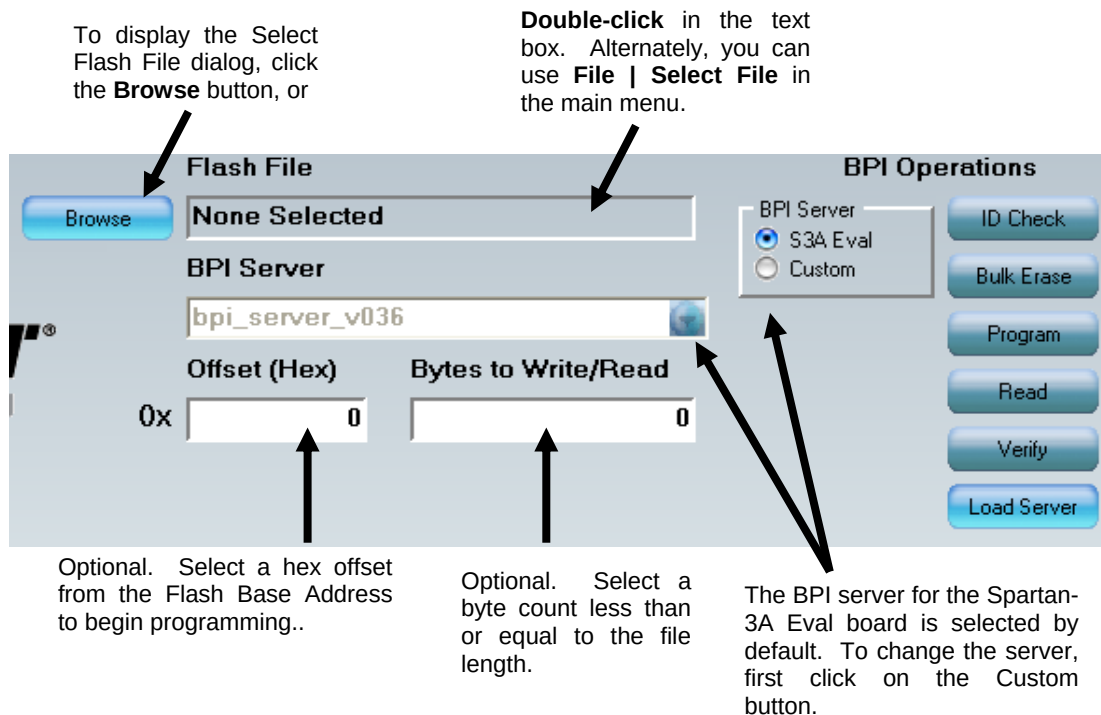


Figure 26 – BPI File Controls

When the Select Flash file dialog displays, navigate to the desired file, select it in the window and click the **Open** button.

Note: A standard .bit or .bin bitstream is created with the most-significant bit located in the upper-most position of the file. In the case of parallel flash, the configuration connection in BPI mode uses the least-significant bit of the byte as the most-significant bit into the configuration engine. Therefore, all bytes have to be bit-reversed before programming to the flash. Furthermore, our server is a x16 interface to the flash while the BPI interface is x8. Therefore, the bytes in each 16-bit word have to be swapped. A utility to perform the necessary conversion is included on the Avnet DRC as part of the BPI reference design for the Spartan-3A Eval board.

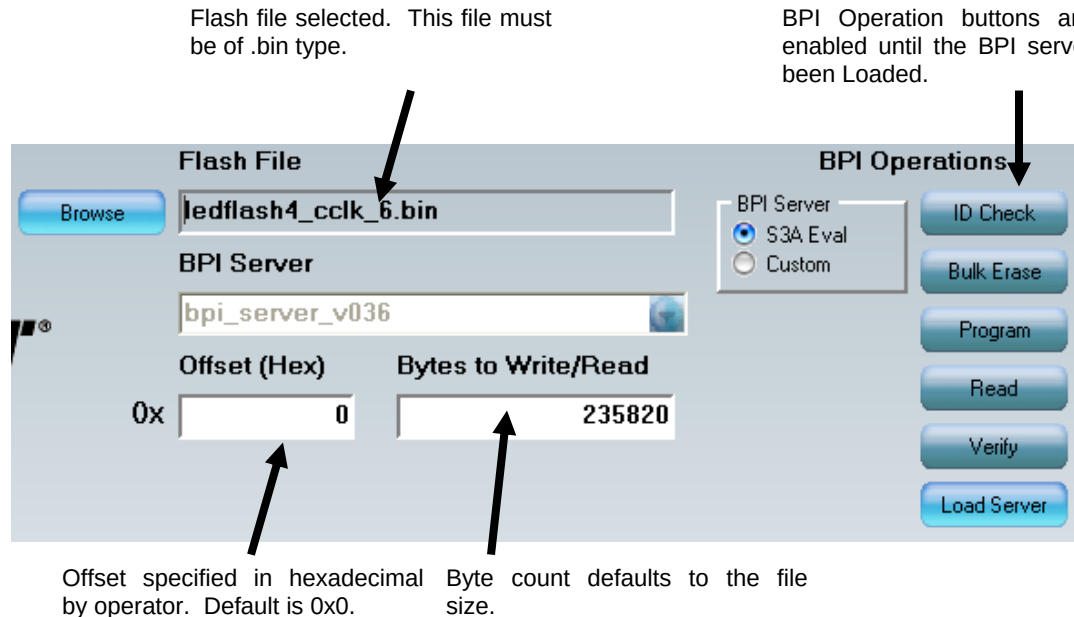


Figure 27– BPI Server ready for Loading

The byte count is automatically set to the size of the selected file, but this value can be changed to program only part of the file if desired.

3.4.2 Load Server

The BPI flash is programmed indirectly from the AvProg GUI, by directing a MicroBlaze program (the BPI Server) running in the FPGA. The BPI Server receives instructions and data from AvProg, but it is the server that performs the actual programming.

The server included with the package has been written for the Spartan-3A Eval board, and is the default server selected for the FPGA. You can write your own BPI server for a custom board, and it will appear in the BPI Server dropdown list if:

1. you place the bit file in the AvProg installation folder, and
2. name the file in the same format as shown above, with a different version number. (**bpi_server_vNNN.bit**)

To change the BPI server used, you must first click on **Custom** radio button to the left of the BPI Server dropdown list.

When using the Spartan-3A Eval Board, the version of the BPI server has been matched with the AvProg GUI, and if the versions are incompatible an error message will be issued when you try to load the server. In this case you will need to update the software from the Avnet DRC.

<http://em.avnet.com/drc>

To load the BPI server, simply click the **Load Server** button. The interface will change to FPGA Configuration mode for the load process, and when the download has finished, it will revert back to BPI Programming mode with the BPI Operations buttons enabled. If you are using the Spartan-3A Eval board, you will see output from the BPI server in the Receive Console.

```

Receive Console
*                               \=====/*
*                               \=====/*
*****
*      Spartan-3A Spansion BPI Programming Utility 036      *
*****
Type <help> for options
AVT>

```

Figure 28 – BPI Server Banner

If you encounter any issues with the download process, consult the **Configure FPGA** section of this document for potential solutions.

3.4.3 ID Check

The **ID Check** button will not activate until the BPI Server has been successfully downloaded.

Each flash family has a unique ID, so it is always good practice to click the **ID Check** button once to verify that there is a good communication path between AvProg, the BPI server and the Flash device.

The BPI server reports the result of the ID check in the receive console. If the ID returned was not the value expected, the message would indicate "ID Test failed".

```

Receive Console
AVT> i
Manufacturer Code = : 0x0001
Device ID #1      = : 0x227E
Device ID #2      = : 0x221D
Device ID #3      = : 0x2200
ID Test passed.
AVT>

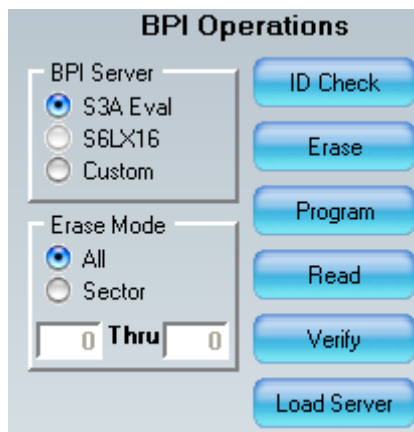
```

Figure 29 – BPI Server ID Check

3.4.4 Erase

The **Erase** button will not activate until communication between AvProg and the board has been established via the **Connect** button, and the SPI server has been loaded.

To erase the entire flash, select the **All** button in the Erase Mode panel and click the **Erase** button. AvProg sends an appropriate command sequence to the PSoC, which initiates the device erase. Depending on the device size, a full erase can take several minutes. AvProg will issue a message for the supported boards indicating an approximate wait time.



To erase specific sectors, click the Sector button in the Erase Mode panel, and pick a range of sectors to clear. Click the Erase button to execute the operation. As each sector is cleared, the sector number will appear in the receive console..

3.4.5 Program

The **Program** button will not activate until the BPI Server has been successfully downloaded, and a Flash file has been specified.

Once the **Program** button is activated, simply click to begin writing the file at the specified offset.

Valid programming can only occur when the sectors to be written have been previously erased. It is entirely the responsibility of the operator to ensure this condition exists prior to programming.

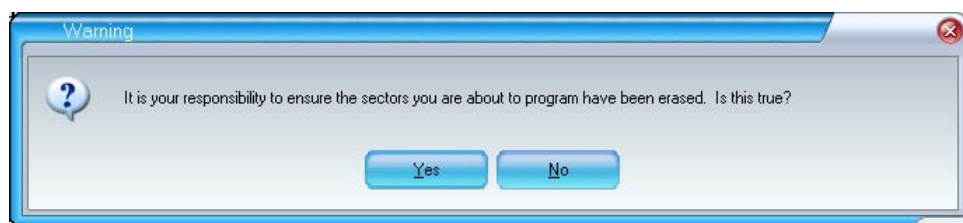


Figure 31 – BPI Program Erase Check Dialog

If the sectors have been erased, click **Yes**. To abort the programming operation, click **No**.

If programming proceeds, AvProg transfers the data file to the BPI server running on the board, and it performs the programming operation at the specified location. The results are summarized in the receive console, shown highlighted in the illustration below.

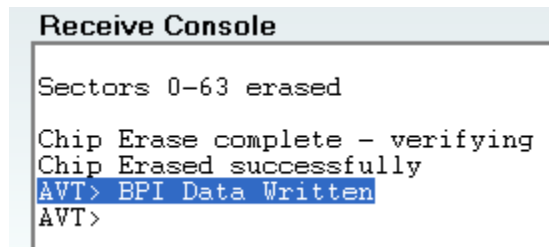


Figure 32 – BPI Server File Program Confirmation

3.4.6 Read

The **Read** button will not activate until the BPI Server has been successfully downloaded, and a Flash file has been specified.

This command reads the contents of the SPI memory for bytecount bytes from the specified offset and copies the data into your file. A warning message will post each time this command is activated to alert the operator that the specified file is about to be overwritten.

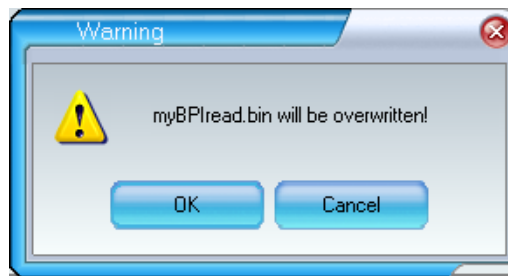


Figure 33 – BPI Read Overwrite Warning Dialog

Click **OK** to continue, and **Cancel** to abort the operation.

If you fail to specify the number of bytes to read, you will receive the following message.

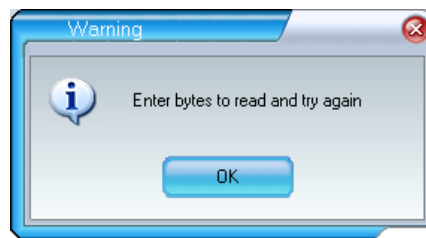


Figure 34 – BPI Byte Count Warning Dialog

Enter a byte count in the **Bytes to Read/Write** field and try the operation again. A progress bar displays to show the status of the operation. Once the read is complete, the results are written to the Receive Console, shown highlighted in the illustration below.

```
Receive Console
Chip Erase complete - verifying
Chip Erased successfully
AVT> BPI Data Written
AVT> BPI Read complete!
Ending Address Read was 0x8383992C
AVT>
```

Figure 35 – BPI Server Read

3.4.7 Verify

The **Verify** button will not activate until the BPI Server has been successfully downloaded, and a Flash file has been specified.

This command reads the contents of the SPI memory for bytecount bytes from the specified offset and compares the data read with your file. No data is overwritten in this operation, but you must specify a byte count or you will receive the same warning message as seen above in the **Read** command.

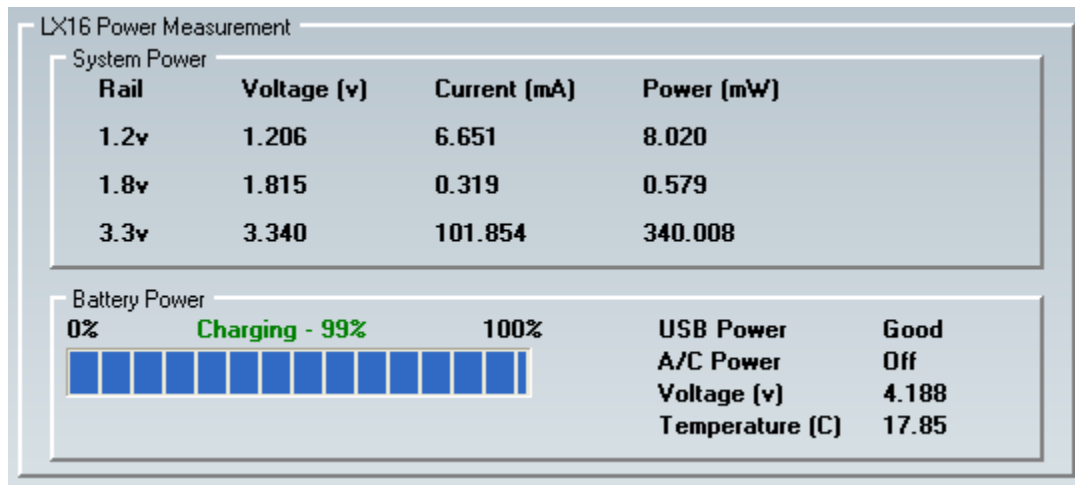
A progress bar displays to show the status of the operation. Results are reported in the Receive Console, highlighted in the illustration below.

```
Receive Console
Chip Erased successfully
AVT> BPI Data Written
AVT> BPI Read complete!
Ending Address Read was 0x8383992C
AVT> BPI validated!
Ending Address Read was 0x8383992C
AVT>
```

Figure 36 – BPI Server Verify

3.5 Measure LX16 Power

When you are connected to a Spartan-6 LX16 Evaluation board, the menu option for Measure LX16 Power will be active once a connection between AvProg and the board is established. If you select this mode, the main panel shows various power states of the board in real time. You can use this mode any time it is available, but the primary motivation for this information is to measure the board power when an FPGA application is running.



In the top part of the panel, live measurements for Voltage, Current and Power are shown for each of the three power rails on the evaluation board. These numbers will update in real time.

In the lower part of the panel, the state of the battery is shown on the left. The bar graph shows the battery power, and whether the device is charging or not. The battery will charge when the board is connected to an external power source, including USB. On the right, the display shows the available external power, the current battery voltage and the battery temperature.

3.6 Advanced Panel Controls

The communication parameters used between the host computer and the PSoC have been optimized for performance and are applicable to most computers running supported Windows operating systems. In rare cases problems do arise, and in those corner cases the Advanced controls allows modification of the parameters to get the system operational.

3.6.1 Timer interval in millisecs and Timeout Loop Limit

AvProg has an internal state machine for each operational mode, and the states are advanced when the PSoC acknowledges the current operation. The default value has been set as low as possible for performance reasons, but on some hosts it may be necessary to increase the timeout value to receive a response from the board.

Use when: AvProg displays a message box with the text:

No ACK from state nn

Timer interval in millisecs	Timeout Loop Limit
15	4

What to do:

Increase the Timer Interval value in 10 millisecond increments and try the operation again. If you exceed 50 milliseconds and the system still does not work, try increasing the Timeout Loop Limit as well.

3.6.2 BPI Burst Size

AvProg sends BPI data to the MicroBlaze server in frames of BPI Burst Size. If the serial channel is not optimal, it is possible that data can be corrupted.

Use when: BPI programming is consistently failing.

BPI Burst Size
128

What to do:

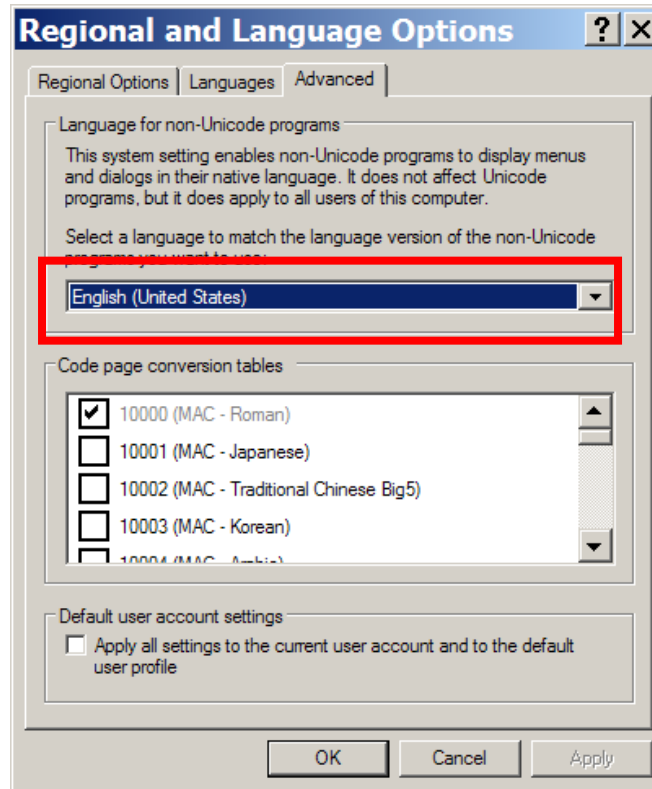
Reduce the BPI Burst Size by factors of 2 and retry the operation.

4.0 Known Issues

1. On Windows systems utilizing a Unicode character set, serial communication is disrupted since the control characters are modified by the operating system before transmission. The result is that AvProg is unable to communicate with the Cypress PSoC device on the Spartan-3A Eval board.

To correct this problem, you must temporarily change the default character set on the host system to English. Follow the instructions below to do this on a Windows XP system:

- a. Launch the **Control Panel** from the Start Menu.
- b. Double-Click **Regional and Language Options**.
- c. Select the **Advanced** tab.



- d. Select **English** in the list box, as shown below.
 - e. Click the **OK** button.
2. When changing modes between SPI and BPI programming, the **Offset** and **Bytes to Write/Read** fields will reflect the last operation. This is only an issue if you, for example, program SPI, then program BPI, and then return to SPI mode and wish to program the same file again. In this case you may need to manually update the **Offset** and **Bytes to Write/Read** fields.

5.0 Appendix I – AvProg Spartan-3A Eval Quick Start Guide

Once AvProg and the USB driver have been installed, you can use this section to quickly perform basic functions. For details on all the program features, please consult the **AvProg Host Interface** section.

For the simplest operation, configure the board jumpers as follows:

J3	1-2 (USB Power)
JP5	2-3 (Suspend On)
JP6	1-2 (SPI Select)

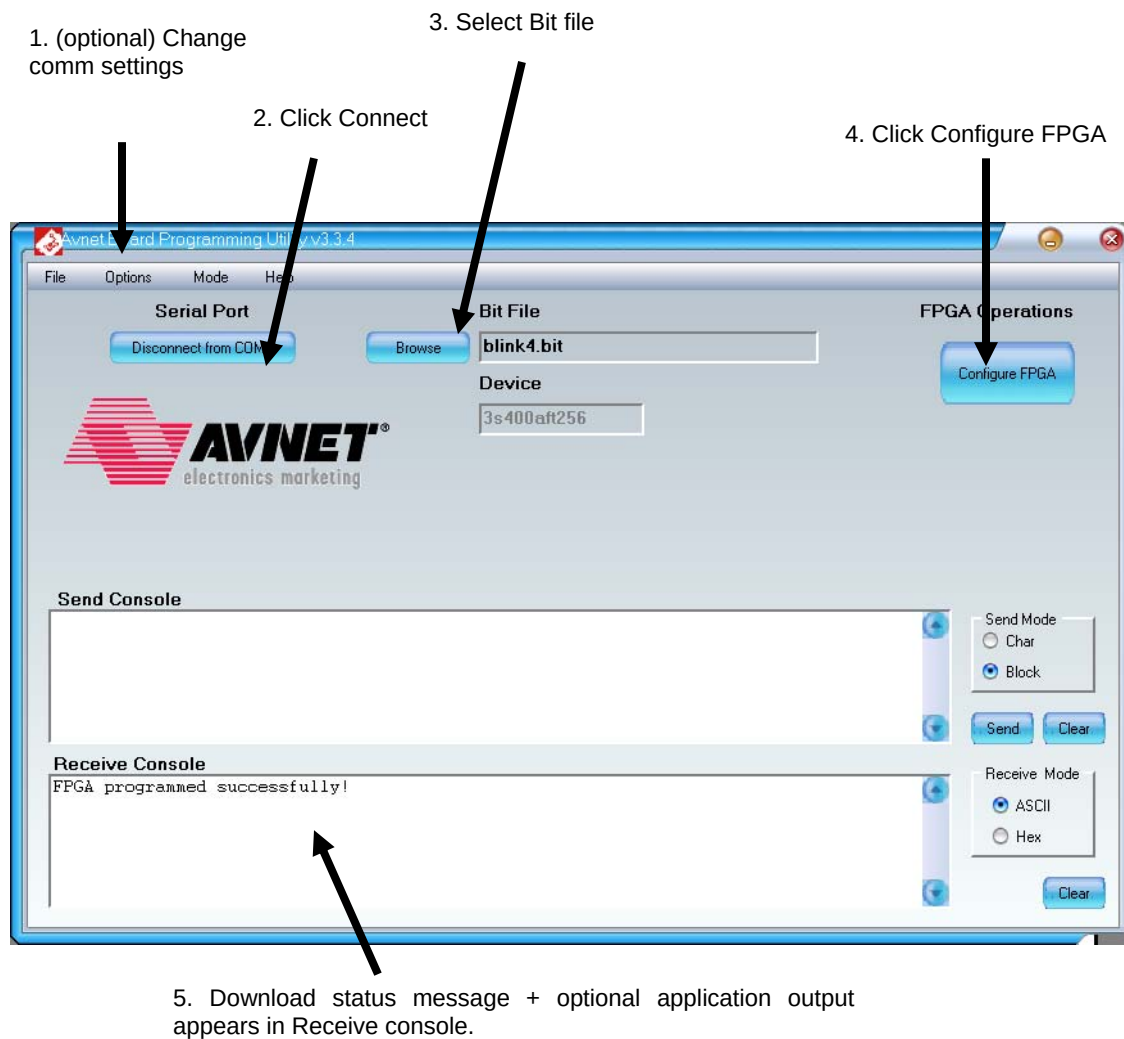
There should be no other jumpers installed on the board.

Plug the USB cable between the Spartan-3A Eval board and a port on the host that has previously been used with the board. Launch AvProg from the Windows Start menu.

Start | (All) Programs | Avnet | AvProg

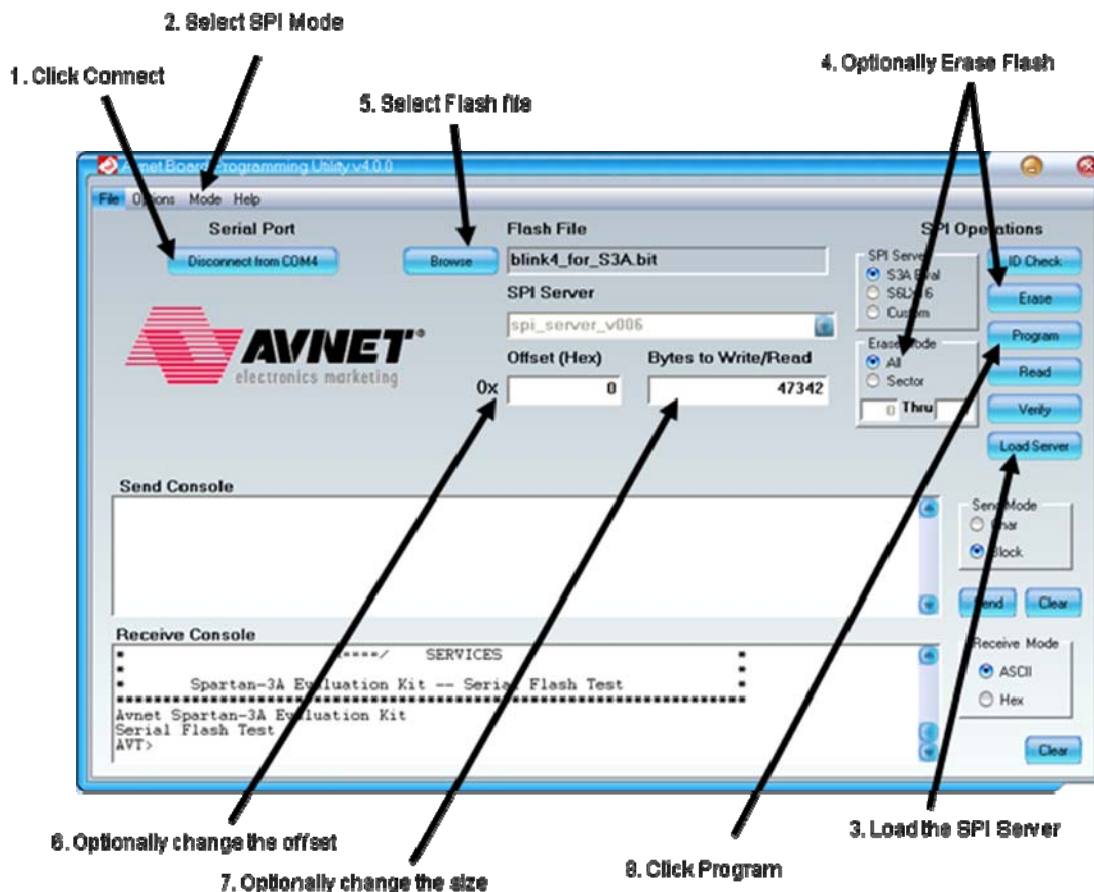
5.1 Configure the FPGA

1. If you need to see output from an application in Receive Console, you must first change the communication parameters to match your bitstream. By default, AvProg communications over the serial link at 115200,n,8,1. To change the settings, select **Options | Comm** from the main menu.
2. Click the **Connect** button.
3. Click the **Browse** button and select a bit file to download.
4. Click the **Configure FPGA** button.
5. Results of the FPGA download appear in the Receive Console.



5.2 Program the Spansion SPI Flash

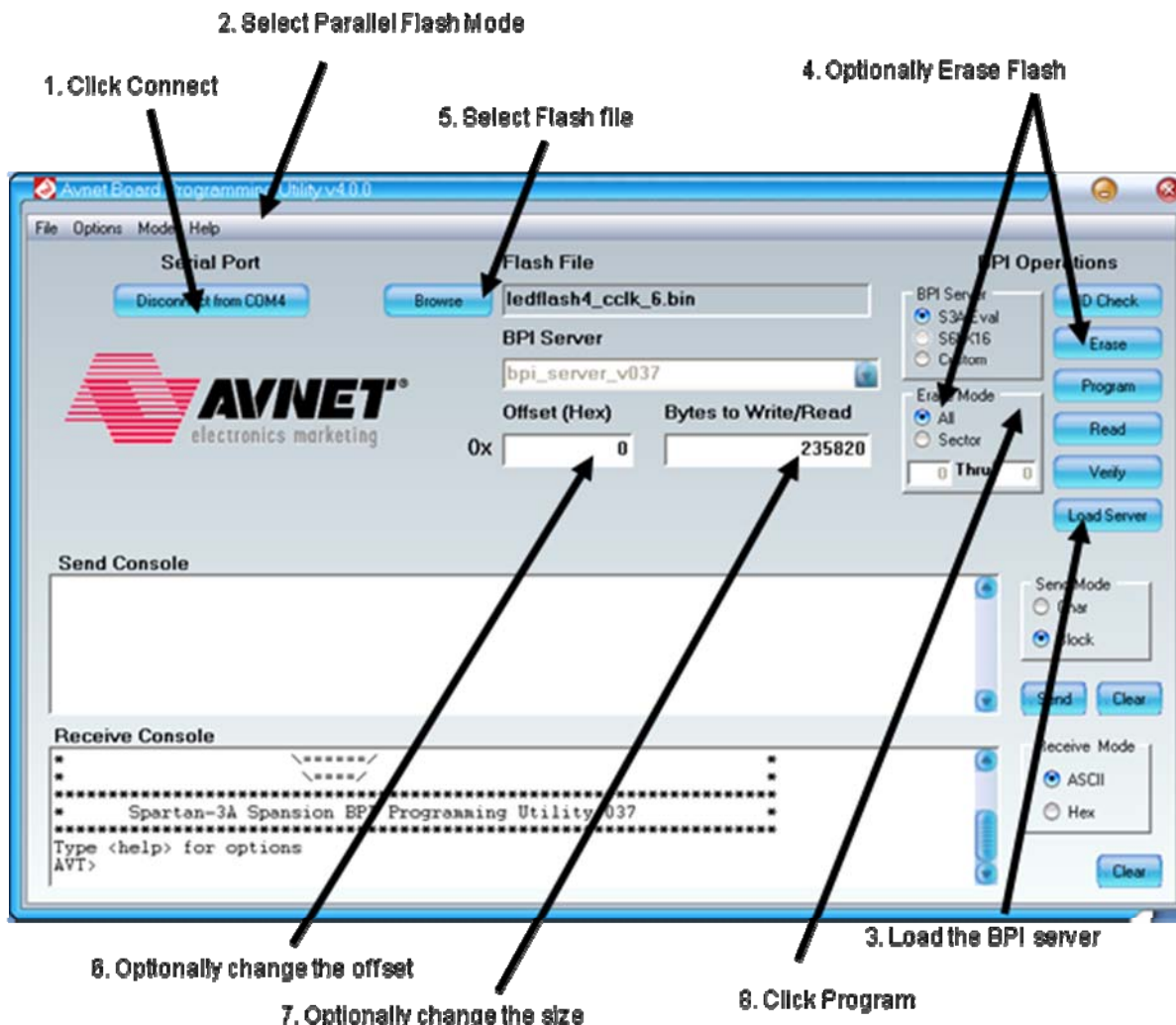
1. Click the **Connect** button.
2. Select **Mode | Program SPI Flash** from the main menu.
3. Click the **Load Server** button.
4. The flash sectors you are about to program must be erased before successful programming can occur. If you are unsure, click the **Erase** button to erase the entire serial flash.
5. Click the **Browse** button and select a flash file to program.
6. Optionally change the offset from 0x0 to a location starting at a sector boundary.
7. Optionally change the number of bytes to program. By default, the entire file is programmed.
8. Click the **Program** button.



To load the FPGA from the SPI flash location 0x0, place jumpers on JP4 (MODE) in positions 3-4 and 5-6. Cycle power to the board and the FPGA will program and execute any BRAM application included. If your application has serial output, it will be displayed in the Receive Console (as long as your communication parameters match – see the first item under the Configure the FPGA section for details).

5.3 Program the Spansion BPI Flash

1. Click the **Connect** button.
2. Select **Mode | Program Parallel Flash** from the main menu.
3. Click the **Load Server** button.
4. The flash sectors you are about to program must be erased before successful programming can occur. If you are unsure, click the **Bulk Erase** button to erase the entire parallel flash.
5. Click the **Browse** button and select a binary file to program.
6. Optionally change the offset from 0x0.
7. Optionally change the number of bytes to program. By default, the entire file is programmed.
8. Click the **Program** button.



To load the FPGA from the BPI flash location 0x0, place jumpers on JP4 (MODE) in positions 1-2 and 5-6. Cycle power to the board and the FPGA will program and execute any BRAM application included. If your application has serial output, it will be displayed in the Receive Console (as long as your communication parameters match – see the first item under the Configure the FPGA section for details).

6.0 Revision History

Date	Version	Revision
6/6/08	1.0	Initial Version: AvProg 3.3.3
2/9/09	1.1	Windows XP SP3 / Vista Driver: AvProg 3.4.0
3/16/09	1.2	Corrected section 2.2 to remove second .inf file and add .sys file.
6/24/09	1.3	Installshield Update
5/6/10	4.0	Updated for LX16 Release
6/10/10	4.1	Updated to reflect changes in the production Driver folder
6/21/10	4.2	Added Quiet mode, updated lx16 driver procedure, updated lx16 pwr mgt
6/28/10	4.0.5	Made PSoC hex versions generic, updated doc version to match AvProg